Orvis Reil

BIENNIAL REPORT OF THE DEPARTMENT OF HIGHWAYS

STATE OF NEVADA

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STATE OF NEVADA

NINETEENTH BIENNIAL REPORT

OF THE

DEPARTMENT OF HIGHWAYS

For the Fiscal Years of
July 1, 1952, to June 30, 1954

H. D. MILLS
State Highway Engineer

CARSON CITY, NEVADA
STATE PRINTING OFFICE - - JACK MCCARTHY, SUPERINTENDENT
1954

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LETTER OF TRANSMITTAL

To the Honorable Members of the Board of Directors and the Nevada State Legislature:

Your State Highway Engineer respectfully submits herewith the Nineteenth Biennial Report of the Department of Highways, embracing the activities of the Department for the fiscal years 1953 and 1954.

We take this opportunity to express our sincere appreciation for the cooperation and support received from the Board of Directors, the Bureau of Public Roads, and the people of this State.

H. D. Mills

State Highway Engineer.

In Memoriam

During the biennium the following employees of the Department of Highways were taken by death:

Harry T. Bell
Harry S. Botsford
James Carter
Eubert W. Fidler
Leno Tirso Garro
Leon A. Mack
Ray Mullen
Lafe E. Roe
Lloyd Root
Ray Stewart
George F. Turner
Arthur Ward

DEDICATION

The Nineteenth Biennial Report of the Nevada Department of Highways is dedicated to the many employees whose faithful service of 15 or more years has been an essential factor in making Nevada one of the leaders among road builders of the Nation. This report gives opportunity to mention the names of those who have been with the Department for 35 years.

35 OR MORE YEARS OF SERVICE

Reid, Bonnie Ola

30 TO 35 YEARS

Armstrong, G. F.
Berning, A. (Dutch), Jr.
Glock, J. A.
Hancock, J. L.
Heidenreich, Andrew
Holcomb, W. T.
Lewis, Robert J.
Mills, H. D.
Parry, W. R.
Pohl, E. C.
Rawls, Paul R.
Schultz, Marion I.
Sullivan, John M.
Sutherland, David L.
Wright, W. O.

25 TO 30 YEARS

Berger, Frank J.
Blaker, Charles C.
Boden, Eldor J.
Brown, H. Coleman
Cross, Ernest
Dunn, Walter E.
Eldredge, Reuben E.
Games, Alice Quinlan
Harmer, Francis J.
Heaps, Wilford
Little, L. W.
Logan, Ben H.
Miller, Frank E.
Morrison, F. H.
Perry, James A.
Rose, Dale V.
Roy, Roland F.
Squires, Herbert A.
Waite, Marvin H.

20 TO 25 YEARS

Austin, N. H.
Bennetts, Ralph H.
Boardman, E. T.
Bonafous, Joe
Brockway, G. B.
Brown, Charles L.
Carroll, Frank J.
Christensen, Joseph O.
Clyde, Victor W.
Coleman, George P.
Dron, Thomas L.
Fell, Verrill W.
Ferretti, Eugene L.
Fodrin, Melvin J.
Gibson, W. H.
Greenhalgh, Jack F.
Leavitt, Thomas D., Jr.
Leutzinger, Edward G.
Manhire, John T.
Marling, Herbert
McCoy, John
McMurtrey, E. A.
Meacham, J. D.
Miles, Cyril D.
Odell, W. Allan
Parvin, Jack
Robbins, Paul E.
Scoggin, E. G.
Sharp, Dave
Smith, Charles F.
Springmeyer, Carl A.

20 TO 25 YEARS—*Continued*

Hannig, Reed A.
Hays, D. H.
Kinne, A. G.
Sundeen, Stanley D.
Vaughn, Harold J.
Welsh, Andrew

15 TO 20 YEARS

Barrett, Ralph D.
Bawden, John E.
Baxter, George M.
Bloxham, L. J.
Borgna, Victor E.
Bradley, Delile
Bradley, Ralph W.
Brotherton, Harry
Chambers, L. G.
Cochran, L. F.
Corning, John
Davis, Allen A.
Davis, Fred A.
Gregory, J. J.
Greulich, Fred G.
Grier, George R.
Haffey, John J.
Hamp, Leonard H.
Harbin, Guy S.
Hayman, Walter F.
Howard, A. A.
Johnson, Mathias
Johnson, Orrin H.
Killeen, James H.
Kinnikin, Margaret
Koontz, Louis K.
Kramer, Ambrose T.
Kramer, Jessie J.
Lane, Bruce M.
Leavitt, Vincen E.
Lucas, Harry
Manchester, James E.
Marty, Eugene H.
Mayett, Albert W.
McCardle, John E.
McDermott, Tony H.
Davis, Russell B.
Deck, Ted
Deprati, Pete
Doty, Stanley P.
Drummond, Fred
Dube, Paul J.
Farnsworth, L. Grant
Gallagher, Thomas L.
Gardner, Bill G.
Gay, Donald V.
Giraud, Joseph J., Jr.
Gobeli, Fred
Green, Arthur T.
McGrath, John
McInnis, J. R.
Meder, Zita D.
Metzger, Harry M.
Moore, Lemuel M.
Murphy, Cornelious E.
Newnham, Chester
Offen, Elmer B.
O'Sullivan, James
Ottini, Ralph J.
Pierce, Bryant H.
Pratt, John W.
Rainey, Charles P.
Ream, Mary L.
Reed, Chester H.
Reil, Orvis E.
Rochon, Mary
Ross, Milton F.
Schultz, Joseph E.
Stevens, Glen S.
Walker, Oren W.
Williams, Zeddie A.
Zilkey, Willard O.

STATE HIGHWAY OFFICIALS AND DEPARTMENT HEADS

BOARD OF DIRECTORS

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Honorable W. T. Mathews, Attorney General	Member
Honorable Peter Merialdo, State Controller	Member

DEPARTMENT HEADS

H. D. Mills	State Highway Engineer
W. T. Holcomb	Assistant State Highway Engineer
A. G. Kinne	Engineer of Design
J. D. Meacham	Construction, Maintenance and Secondary Roads Engineer
A. Berning, Jr.	Administrative and Personnel Officer
Charles C. Blaker	Equipment Engineer
E. T. Boardman	Bridge Engineer
Orvis Reil	Planning Survey Engineer
F. H. Morrison	Materials and Testing Engineer
James D. Wallace, Jr.	Right of Way Engineer
Stanley D. Sundeen	Office Engineer
L. W. Little	Assistant Materials and Research Engineer
Paul R. Rawls	Location Engineer
Oren W. Walker	Assistant Engineer of Design
Ralph J. Ottini	Traffic Engineer
Frank Berger	Engineer—Federal Aid Roads
R. E. Eldredge	Assistant Construction Engineer
E. C. Pohl	Auditor
Fred G. Greulich	Editor, Highways and Parks
Herbert E. Samuels	Radio and Communications Supervisor

DIVISION ENGINEERS

W. O. Wright	Division No. 1
J. L. Hancock	Division No. 2
J. A. Glock	Division No. 3
W. R. Parry	Division No. 4
D. H. Hays	Division No. 5

ASSISTANT DIVISION ENGINEERS

G. B. Brockway	Division No. 1
H. A. Squires	Division No. 2
Paul Robbins	Division No. 4

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Governor
Chairman, Board of Directors

W. T. MATHEWS
Attorney General
Member, Board of Directors

PETER MERIALDO
State Controller
Member, Board of Directors

H. D. MILLS
State Highway Engineer

DEPARTMENT OF HIGHWAYS
NINETEENTH BIENNIAL REPORT

Nearly four decades have passed since the first report of activity and accomplishment was made by this Department. Some who were employed in those early days are still with us and can recall with vivid memories the changes and growth that have occurred in our many divisions and in our type of work. It was a mere handful of men and women who formed the first group of Highway Department employees in small, crowded quarters over the State Printing Office. It was the chore of that first Highway Department to accept the responsibility of maintenance and construction of highways in the State of Nevada. Today, the scope of activity has grown to the point where some seven hundred persons are employed.

The construction of highways since that early day, with but minor exceptions, has been financed through revenue derived from road-user taxes, both State and Federal. As the years have passed, automobiles have increased and trucks have come into their own. With more and more vehicles on the road, more and more need for roads and more need for revenues have been developed. Progress has continued to the point where at the close of this biennium, Congress found it necessary to approve an Act amending and supplementing the Federal-Aid Road Act of 1916, which will be known as the Federal-Aid Highway Act of 1954, and which makes available to this State nearly one-half again as much Federal-aid money as had been previously available.

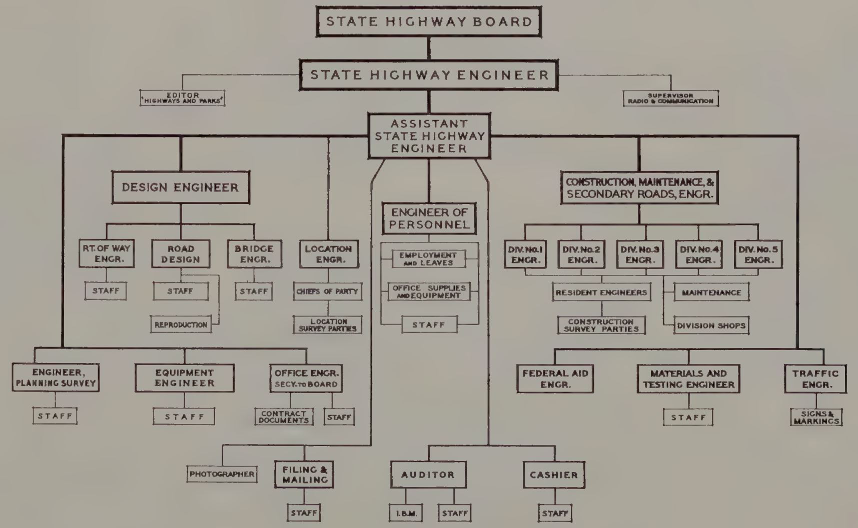
While we have been troubled somewhat in the past due to our peculiar position of not being able to hire enough engineering personnel to keep up with the continued demands of design, right-of-way acquisition, material testing and all of the other phases of highway construction and maintenance, this added apportionment of funds means that we must redouble our efforts to secure help and provide working space and conditions in order that our highways can be rebuilt to the standards demanded by today's traffic.

As our engineering workload has increased, so have the activities of our general staff. The stepped-up rate of right-of-way acquisition has necessarily resulted in an increasing demand on the Attorney General's office. It is now felt that the establishment of a legal division in the Department would be desirable and justified since such a division would aid the Attorney General in those routine matters necessarily incident to the proposed highway construction program.

As the highways are being redesigned with a thought toward today's higher-powered automobiles and faster-moving trucks, and with safety in all communities in mind, there is more and more need that speed zones be established in certain areas. At present we have no maximum speed limit laws on our statutes and we do not feel that the need of one is indicated at this time. However, since many of our high speed areas are suddenly terminated near schools, populated agriculture districts and small communities, the safety of the public can be protected only by reduced speeds in these areas. Since such conditions as road design,

ORGANIZATION CHART

STATE OF NEVADA
DEPARTMENT OF HIGHWAYS



JUNE 30, 1954

traffic congestion and so forth, must be studied and understood before a zone can be established, and since it follows that the highway engineer is best qualified to determine the maximum safe speeds, it is recommended that the authority to establish these speeds be placed within the Highway Department and the Highway Engineer, rather than in the hands of the County Commissioners, as it is at present.

The increased Federal-aid highway appropriations, authorized by the 1954 Congress are accompanied by Federal regulations prescribing minimum design standards and right-of-way widths for roads carrying heavy traffic volumes. Although especially applicable to the Interstate Highway System, which in Nevada comprises U. S. Routes 40 and 91, these regulations include all routes on which Federal funds are expendable.

In order to provide a smooth and safe traffic flow limited access is required for four-lane highways. Sufficient right-of-way widths are required for furnishing frontage or service roads with access on to the main highway limited to infrequently spaced locations where provision can be made for safe entry or exit.

Such a design requires control of access, an authority which the Department does not now have but which will be required before the Interstate System can be constructed to standards established by Federal regulations. It is recommended that consideration be given to the passage of legislation which will give the State the authority to acquire access rights, the need for which is outlined above.

The Highway plant, as it was begun nearly 40 years ago, has grown with little improvement or replacement, until the past few years. As has been possible, capital improvements have been made to the extent of rebuilding maintenance residences, the construction of a new division headquarters at Tonopah, and at the present time under construction, a new division headquarters at Elko. However, the Equipment Division at Reno is operating under cramped inefficient conditions in a building designed for a smaller number of vehicles and fewer persons than are now used on highway construction and maintenance. Also, the work of the Division II staff at Reno has increased to the point where the quarters furnished in the State Building in downtown Reno are no longer adequate for the present rate of highway construction and maintenance, nor will they be adequate for the present rate of increase in construction made by the recent increase in Federal aid. Therefore, it is necessary that within the coming period a new equipment and division headquarters be constructed at the site of the present Reno plant.

Also, the increased highway construction program has made it necessary to add considerably to those divisions of the Highway Department at Carson City, primarily concerned with right-of-way acquisition, roadway design, surveys, location and testing.

Just a short period ago the department moved into new quarters in the State Building where it was felt that ample space could be available under the then existing highway program. However, not only was the building reduced in size to accommodate a smaller site, but other State agencies take up some space in the building that was intended for highway use, and the number of employees has increased materially. Under the accepted program, it would be impossible for adequate working facilities in the present structure, even if the Highway Department

Division Five headquarters and shops, Tonopah. Completed in Spring, 1954, this up-to-date, spacious, well-equipped plant is a prototype of division headquarters now under construction at Elko.

Upper—Adequate working space allows easier, quicker maintenance and repair. Lower—Properly designed office space is attractive to both visitors and employees.

were to be given the entire building. We, therefore, ask consideration of our needs and of the benefit that would accrue to other State agencies if the space in the present State Office Building now occupied by the Highway Department were made available to them, and larger quarters provided for the Department.

PERSONNEL

The Federal-Aid Act of 1954 increased the appropriations to the various States very materially in respect to road construction. In Nevada the annual increase for the years 1956 and 1957 is approximately $3 million over the appropriations for the years immediately preceding. President Eisenhower also is recommending an accelerated road construction program over that which is possible under the increased appropriations mentioned above.

For the increased road program made possible through the Federal-Aid Act of 1954 alone, it will be necessary for the Highway Department to increase its personnel substantially in order to prepare plans and get the projects under way within the allowable time. Should the President's recommendation go through, the increase in personnel will probably reach some 50 percent over that we now have, especially in the divisions assigned to the preparation of plans, the acquisition of rights of way, the testing of materials, and the survey crews themselves, both location and construction. The Personnel Act of 1953 has made it possible for us to increase our salaries to engineering assistants and up to the present we have been able to acquire and maintain a force adequate to carry on construction under appropriations for 1954 and 1955. It appears very improbable that we shall be able to pick up enough help to carry on the proposed increase of work as fast as that increase should occur.

Due to expansion in the highway program and because certain phases of highway engineering and administration are necessarily specialized, requiring positions which cannot be filled by applicants of general qualifications only, but with employees having specific engineering training in highway work, the Department has been and still is confronted with a serious personnel problem, particularly in the field of skilled technical help. In order to carry on with the rapid expansion of the program it became necessary to accelerate the promotion and advancement of present personnel to higher and more responsible positions.

Salaries paid by industries and other agencies have a strong beckoning power for personnel engaged in State highway work where salaries are not geared to present-day rate. Lack of sufficient experienced personnel has been reflected in a measure during the past biennium in delays in location surveys, preparation of plans, acquisition of rights of way and staffing of crews to supervise construction projects.

The creation of the new State Personnel Department is expected to alleviate this situation, as it moves into full operation. This new agency is in a position to assist the Highway Department in a number of ways:

First, through the application of positive recruitment techniques such as newspaper and radio publicity, paid advertising, and contacts with professional engineering organizations.

Secondly, through the screening of applicants by means of written and oral examinations which will undoubtedly result in the appointment of well-qualified employees.

Thirdly, through the technical assistance provided by the Personnel Department in developing a program of adequate salaries in the engineering classes, thereby assisting materially in the recruitment of competent people to the Highway Department.

Further, the job security and opportunity for promotional advancement offered by the new merit system will, it is believed, do much to attract and retain highly qualified individuals for the Nevada State service. Promotion through merit is, in fact, the heart of a career system.

ROADWAY DESIGN

It is the responsibility of the Design Division to prepare plans, specifications and estimates for all construction, reconstruction and betterment projects undertaken by the State Highway Department.

In preparing plans for a project there is a vast amount of detailed work involved to incorporate in the design all data gathered by other divisions of the Highway Department. This includes review of location, reconnaissance and survey, preparation of data for a program to request Federal funds, and preparation of project statement maps and other maps required by the Bureau of Public Roads for Federal-aid projects. After a project has been programmed by the State and approved by the Bureau of Public Roads, preliminary plans showing alignment, profile grade, proposed grade line and all pertinent topography are prepared and furnished to the Materials and Research, Bridge, Right of Way, and Construction Divisions for their respective uses in making specialized investigations of the various phases of data which will control design. These specialized data include soil characteristics, type and location of available material deposits, type and size of large structures such as bridges, overpasses, underpasses or special structures, right of way required and the size and location of minor drainage structures. The results of all these specialized studies and investigations are then correlated by the Design Division and incorporated into the final or over-all design of a project.

The design standards for a given project are controlled first by the system classification, i.e., Interstate, Primary or Secondary; secondly, whether in a rural or urban area; and thirdly, and by far the most important, by the type and volume of traffic to be carried. As a Nationwide guide and in an effort to secure uniformity within the 48 States the American Association of State Highway Officials has recently prepared a design manual which sets forth the minimum requirements recommended for the various systems. Here again the basis for these recommendations is the type and amount of traffic. The important controls in this design manual are width of travel lanes, width of shoulders, curvature, gradient, superelevation on curves, sight distance, safe driving speed, thickness of base and surface, width of median if a divided highway, channelized intersections, etc. In general, the design standards previously developed and used by Nevada are at least as high as the minimum standards as set forth in the AASHO design manual.

Upper picture appeared in 18th Biennial report, captioned: "Ample space—." Increased money for road construction made necessary a larger design force. In June 1954, the same room looked like this (lower). And more designers will be needed to keep up with the 1955–1956 construction program!

Two 4-lane divided highway projects on Interstate U. S. 40, in the vicinity of Reno, were designed and placed under contract during the biennium. Both projects presented extremely difficult design problems due to the terrain and the large volume of traffic that had to be carried through construction at all times. The Southern Pacific Railway, the Sierra Pacific Power lines, the Bell Telephone overhead line and buried cables, and the highway itself are all located within the confined area of the Truckee River canyon. Traffic at times reached as high as 600 cars per hour.

On both projects excellent alignment and grade have been secured and a 28-foot median divider provided to protect and separate opposing traffic.

There were also designed, during the biennium, a number of channelized intersections with lighting, and in some instances, traffic signals. All of these improvements to the highway system, made necessary by increased traffic, require a vast amount of detailed design work before a project can be placed under contract.

During the past biennium the amount of Federal aid available for all types of highway construction within the State has been increasing. To meet this increase in our construction program it has been necessary to expand the design division. This has been accomplished, to a limited degree, by promotion within the organization, and by employing new personnel. However, at the present time, all available space allotted to the design division in the State Office Building in Carson City is completely filled, in fact, some filing space is now being used as an auxiliary drafting room. Until additional space is available, little further expansion is possible.

Since even larger Federal appropriations will be forthcoming for highway construction the entire Highway Department must be expanded if we are to keep pace. As this expanded highway program is Nationwide a similar condition exists in every State, and, therefore, all other divisions within the Highway Department, as well as the design division, will be hard pressed to carry on this increased highway program.

The average number of employees assigned to the design division during the biennium was 55. This number includes designers, assistant designers, draftsmen, computers and engineering aides in design proper, as well as a crew of five in the reproduction division and two in engineering files for handling engineering records.

During the biennium plans for the following number of projects were completed, and the projects placed under contract:

	Number of projects	Miles
Federal-aid Primary System	15	202.88
Federal-aid Secondary System	25	245.20
Bridge Structures—FAS System	3	1.05
Emergency State Maintenance Projects	2	28.69
Mine Access Roads	2	10.50
Airports	2	
Maintenance Stations (Highway)	7	
Miscellaneous Contracts	4	
Totals	60	488.32

The total cost of plan preparing for the above projects amounted to approximately $789 per mile. This figure, however, cannot be used indiscriminately as a basis for estimating design cost, as the cost per mile varies on each project in direct proportion to the amount of detail involved. As an example, the cost of preparing plans, estimates and specifications for the construction of a 15-mile secondary project from 9 miles north of Pahrump to the Nye-Clark County line was $498 per mile with a contract construction cost of approximately $12,000 per mile, while the cost of primary urban design for a 1.57-mile project from Bonanza Road in Las Vegas to a point near College Avenue in North Las Vegas was approximately $7,000 per mile with a construction cost of approximately $210,000 per mile. The cost of design approximated 2.95 percent of the cost of construction during this biennium.

RECONNAISSANCE AND SURVEYS

The Reconnaissance and Survey Division, during the past biennium, consisted of a location engineer and three to four full-time survey parties of six or seven men each. This is an increase of one survey party during the latter quarter of the biennium.

A reconnaissance is a necessary initial step in the location survey of a route. This is especially true when an entirely new route, or section of route, is to be surveyed for design and construction, and the reconnaissance is usually made as soon as it becomes apparent that the route will soon be programmed for improvement. The primary purpose of this initial route investigation is to determine the most feasible location with regard to mileage, alignment, grades, type of terrain, service the road is to provide, and construction costs, for use as a basis for setting up a specified amount of money for its construction. These initial investigations, in most cases, provide the basis of controls when the actual survey is made and, to a great extent, eliminate extensive field investigations during the course of the survey. In many instances this initial investigation is also necessary and beneficial on resurvey projects for reconstruction along a previously constructed project. This is especially true where changes for a betterment in alignment are desired, and on certain sections where difficult right-of-way conditions have to be considered.

On a per mile basis, considerably more time is required now for survey work than was some years ago. This is due, in part at least, to the personnel situation which has been anything but good for several years now. There has been a shortage of personnel, also insufficient experience and training in the personnel available. However, it is also apparent that a considerable amount of this additional time for present-day highway surveys is due to the ever-advancing standards of highway design and right-of-way requirements. Present-day highway design, especially through urban areas and on multiple-lane highway projects, requires a much wider surveyed area in considerably greater detail than was formerly necessary. After the survey is completed on such projects it is more often than not necessary to make numerous survey adjustments before needed right-of-way widths can be determined and design completed to a point where the project can actually be advertised for bid and placed under construction. This involves more time and expense for the Survey Division.

As in the previous biennium, surveys on secondary highway projects during this past biennial period have greatly exceeded, in mileage, the surveys on primary highway projects. The lower highway design standards on secondary projects permit the construction of more miles of highway for a like amount of money. Practically all of the State's primary highway system has been surveyed and constructed, at least once, while new secondary highway projects are continually being proposed and approved for surveys and construction.

As in the past, surveys during this biennium have been rather well distributed throughout the State with both new and resurvey projects in practically all of the 17 counties, this being especially true in regard to secondary highway projects. Federal funds are apportioned to each of the 17 counties, to be expended on qualified projects proposed by the various counties and the Highway Department and approved by the Bureau of Public Roads. This accounts for the greater distribution of secondary highway surveys. Primary and Interstate funds are appropriately spent on highway routes and sections of routes with the greatest volume of existing or potential traffic. A considerable amount of this primary highway construction consists of multiple-lane highways over mountainous and canyon sections where sight distance is very limited and passing distances cannot be had on 2-lane construction. Other similar projects are in urban areas where 2-lane construction simply does not adequately serve the increasing volume of traffic.

Survey crew takes azimuth reading. Miles of trudging over rough terrain is just a small part of the location engineer's work.

Although the number of projects and surveyed mileage on these primary routes is considerably less than on secondary routes, more time and greater costs are involved in the wider scope and more detailed surveys. During the past biennium the surveys on some of these primary and interstate projects have been completed, while others are still underway. The survey for 4-lane construction on a section of U. S. 50, Clear Creek Highway from a junction with State Route 3, about three miles south of Carson City to Spooners, has been completed; a similar survey through the Carlin Canyon, on U. S. 40 between Carlin and Elko, has also been completed, but may require additional survey work; the Truckee Canyon east of Sparks has been surveyed for 4-lane construction to a point about two miles west of Wadsworth; and the survey is now under way on that portion of U. S. 40 from the easterly end of the present 4-lane highway about one mile west of Verdi to Reno. A survey for 4-lane construction is also under way on a portion of U. S. 91, from the California-Nevada State line south of Jean to Las Vegas.

With the recent increase of Federal funds for highway construction, resulting in an accelerated highway construction program, it is becoming increasingly difficult to keep sufficient surveys in advance for the design and programmed construction program. This has been accomplished to a great extent by employing construction survey crews on location surveys during winter months when construction work is curtailed due to seasonal conditions.

During the past two years, 458.50 miles of surveys on all types of road were completed at an average cost of $969.27 per mile. This is an increase of about 7 percent in mileage surveyed, and about 28 percent increase in cost per mile as compared to the previous biennium.

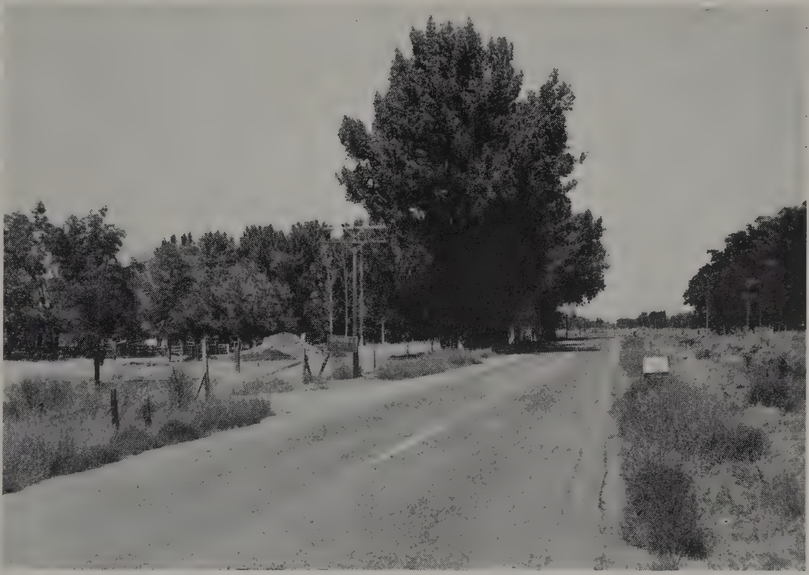
RIGHT OF WAY

The Right-of-Way Division consists of a right-of-way engineer, with a staff of approximately 13, including an office engineer, a clerk-stenographer, 5 agents and 5 draftsmen.

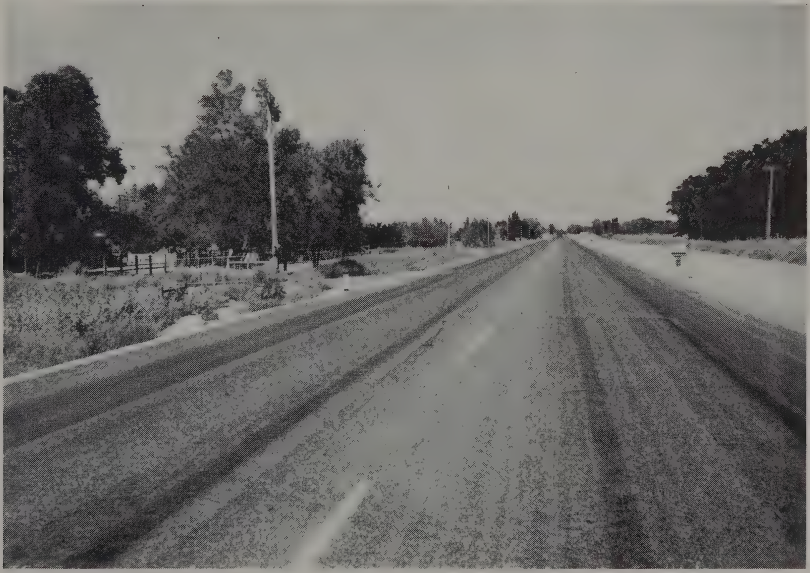
When the alignment is adopted for a highway project and the width of the right of way necessary for the proposed design is determined, action to acquire it is commenced by the Division. This entails determination of ownership, a study of the problems peculiar to the lands involved, and the making of sketches, agreements, deeds and other legal documents, leading up to the eventual negotiations carried on by the agents. If a satisfactory settlement is not attained, it sometimes becomes necessary to resort to condemnation proceedings through the courts.

In the matter of negotiating for the rights of way, the Highway Department must be represented by agents who are familiar with land appraisal, real estate and the effect that highway location and construction have on the property values. This is becoming more and more a major function of the Right-of-Way Division.

During the biennium, rights of way and material sites for highway projects on which construction plans were prepared, together with land for maintenance sites and radio relay station sites were acquired across both public and private lands throughout the State. Acquisition in one form or another was accomplished in each of the 17 counties, some rights of way being acquired considerably in advance of proposed construction. In this connection, the Highway Department was able to



Before and after. Lower picture shows improvements resulting from highway reconstruction. Right-of-way acquisition included removal of trees, new fencing, adjustment of corrals and better drainage (right). Roadway width was increased from 50 to 100 feet.



take advantage of the new provisions of the Highway Law passed during the 1953 Legislative Session permitting the State to acquire in fee any real property necessary for highway construction.

During this period the sum of $291,692.69 was spent for land for State highway use. This figure does not include costs for damages, moving or relocating improvements, salaries and expenses of right-of-way personnel, court costs, fees, printing, office supplies or incidentals. Considerable acreage was granted at no cost, some at the rate of $5 to $25 per acre. Many acres of good farm land were acquired at prices varying from $300 to $500 per acre. Small tracts near cities, especially portions of subdivided acres, were quite expensive as were a few isolated parcels in cities.

In order to keep from paying excessive damages, the Highway Board deemed it advisable to purchase outright the "Tomato Ranch" near Vista on U. S. 40. A small portion of the property will not be needed for highway purposes and will be available for sale.

The largest single transaction was the payment of $185,000 for approximately 11.3 acres of abandoned Virginia & Truckee Railway right of way from the south bank of the Truckee River in Reno to 1,000 feet southerly of Wells Avenue. Title to this land is being quieted in the courts through the Attorney General's office. It is planned to incorporate this in the construction of a major route into Reno from the south. The city of Reno participated in the cost of this right of way.

The State obtained at no cost a quitclaim deed to most of the remainder of the abandoned V. & T. Railway right of way from Steamboat Springs to the west limits of Carson City. A great deal of this right of way will be used to advantage in the realigning and widening of U. S. 395.

Four condemnation suits were commenced in the courts and right of possession granted in all cases. However, final decisions are still pending in all of them. One case was appealed by the defendants to the State Supreme Court. Perhaps the most interesting suit is the action to obtain for highway use that portion of the abandoned V. & T. Railway right of way between Huffakers and Reno Hot Springs.

In all of the above matters a great deal of effort was expended by the personnel of the Right-of-Way Division. Many legal problems are encountered and solutions are worked out as well as possible. There are many agreements, deeds and other documents to be drawn, one of the more involved type being a utility agreement wherein the conditions for making the various adjustments to a facility of a utility company must be clearly stated in conformance with the many existing regulations, especially those of the U. S. Bureau of Public Roads.

Before a contract for the construction or reconstruction of any project in which the Federal Government participates can be awarded, the right-of-way engineer must certify in writing to the Bureau of Public Roads that the rights of way necessary for the project have been acquired in sufficient manner to permit right of entry. Even after this certification has been given, there are many instances where a great deal of work remains to complete all details in winding up some of the transactions involved.

The Federal-Aid Highway Act requires that all rights of way be held inviolate for highway purposes. Although the highway division engineers are primarily responsible for carrying out this regulation, the Right-of-Way Division is called upon quite frequently to assist.

The forthcoming increased Federal-aid expenditures for highway construction and improvement will require a greatly stepped-up program of right-of-way acquisition. Acquiring wider rights of way (200′–300′) on the interstate system (U. S. 40 and U. S. 91) and access rights along the abutting properties will require much new thought and study. Property values are still following an upward trend and the needed lands for highways are going to cost more, too. In order to be able to comply with these new and additional duties and to maintain the existing functions and activities, it is evident that the Right-of-Way Division must be provided with more working space and more trained personnel.

Of extreme importance is the need for legal assistance within the Highway Department.

PLANNING SURVEY

Planning Survey is an essential unit of every State highway department. Its being is by virtue of the Federal-Aid Highway Act, and its inception was founded upon recognition of the importance of highway administration on a sound long-range business basis.

Hence, statistical and economic studies and research have as their perspective the development of factual data on all phases of an integrated highway program, and may be considered in two groups: (1) continuing studies necessary to maintain up-to-date highway statistics and to develop data requisite for the computation of trends, and (2) special studies designed for the solution of technical problems and for administrative purposes.

The continuing studies are pursued in prescribed units as outlined in the following paragraphs; the special studies become assignments of the unit dealing with the problems involved, or, when over-all in character, extend into all units.

INVENTORY

The purpose of the road inventory unit is to maintain a current and adequate record of controlled road location, of adjoining culture, and of mapping control.

Due to limited funds budgeted, it was necessary to again restrict operations to the efforts of two men. Each man operated a truck equipped with gyroscope, odometer, and Dictaphone recorder; one man logging unsurveyed roads and culture, the other devoting full time to mapping control by second- and third-order triangulation as compared to U. S. C. & G. S. standards.

The notes thus obtained are transcribed and coded for IBM punching and tabulating, and the data are then incorporated in a series of tabulations dealing with inventory and traffic facts applying to certain mileage groupings on the several road systems.

Realization of the inestimable value of this historical record is renewed as work is begun on Nevada's assignment in the over-all National Highway Needs Study requested by the Congress in section 13 of the Federal-Aid Highway Act of 1954.

Field work accomplished during the biennium included completion of road logging in the western half of Churchill County and in Esmeralda and Mineral, as well as extension of mapping control over the eastern half of Churchill, and that necessary to complete coverage of Esmeralda and Mineral. Control activities in Lander County were commenced during the last months of the biennium.

In addition, and following an established departmental policy of cooperative relations with Federal and other State agencies, our field crews worked with survey parties of the U. S. Coast and Geodetic Survey in and around the Fallon area, and with the Twelfth Naval District in the Hawthorne area. They also surveyed and flagged certain sections of the Nevada-California State line for the Nevada State Fish and Game Commission, with that agency assuming the costs involved.

This departmental policy is of benefit to all concerned. It facilitates the operations of the other agency; it makes possible the accumulation of a wealth of mapping control by this department at a minimum of expense.

MAPPING

Planning Survey does not primarily maintain a map-distributing agency; however, because of their accuracy, our maps continue in demand by individuals, research groups, and land and oil companies.

It has been found feasible to obtain copyright protection for our maps, and this policy will apply on future publications.

County maps were completed for Clark, Lyon, and Pershing Counties.

A new map of Lincoln County was well under way at the end of the biennium. Having available a complete set of aerial photographs with picture-pointing accomplished by Planning personnel, it was decided to have this county mapped by photogrammetric methods. The planimetric maps were made by the Western Laboratory of the U. S. Production and Marketing Administration (Aerial Photographic and Engineering Service), Salt Lake City, through the cooperation of the U. S. Bureau of Public Roads, and an outline of the detail involved appeared in our publication, "Reinventory, Field Control, and Mapping."

Carried in the same publication was a discussion of certain reproduction processes pioneered in our Planning Survey—principally methods of using autopositive film and stick-up lettering—which attracted the interest of agencies of other States, commercial dealers whose products had been used, and editors of engineering magazines.

Two-color traffic flow maps of Clark (1949), Lyon (1950), Ormsby (1948), Pershing (1951), Storey (1948), and Washoe (1948) Counties were released, as were similar maps of the incorporated cities of Carson City (1948), Lovelock (1951), Las Vegas (1949), North Las Vegas (1949), and Yerington (1950), and State maps depicting traffic as of 1950, 1951, and 1952.

These traffic flow maps are a two-thirds reduction obtained by photographic process of the regular county base map; the colors are superimposed by multilithic methods. The county series portrays data by means of traffic flow bands and figures; the city series portrays numerically block-by-block traffic.

More than 100,000 "Nevada Highways," official road map of the

State, are distributed each year. It is evident that the returns in tourist expenditures warrant the cost of printing and distribution. Much time and study are devoted to the development of this map, and we are proud of its accomplishment.

TRAFFIC

Perhaps the most reliable single criterion to guide the highway engineer and planner in route selection and determination of standards of construction is volume and type of traffic encountered.

Planning Survey collects traffic information by means of automatic recorders maintained at 20 established key sites; by portable automatic recorders; and by manual counts.

During the biennium new sectional 4-lane construction on U. S. 40 necessitated complete double automatic recorder installations at two key sites, one at a point one-half mile east of Sparks, the other 1 mile east of the Nevada-California State line.

Another innovation was a photo-electric recorder built in the shop of our Planning Survey and installed at the key site north of Carson City. The principles involved are similar to those of recorders devised in the States of Texas and New Mexico, with added features which are proving valuable. The recording medium, 35mm film exposed by lighting a dark-box containing counting dials and open lens, is the same as used in the other two States; a clock dial in the dark chamber, the image of which is photographed with accumulated traffic, is a new feature. It permits correlation of count with hour. Replacement of the spring-driven mechanism by an electric clock will eliminate a noticeable weakness. Labor and material costs were considerably less than the price of a manufactured recorder designed to give the same results.

Volumes compiled from tape recordings at the automatic recorders are set forth in a publication entitled *Annual Traffic Report,* as is traffic on all U. S. highways and those State routes comprising the Primary State Highway System. The report also explains methods employed in expanding traffic by predetermined factors.

A continuing study of some magnitude is the annual manual traffic census conducted during a 16-hour period (6 a.m. to 10 p.m.) on a Friday, Saturday, Sunday, and Monday in July, care being taken to select dates which will not reflect holiday traffic; another is the manual survey conducted in January at 51 of the major road junctions included in the July census. These two studies provide comprehensive historical data on the growth of traffic and on classification of motor vehicles.

The printed tabulation of the July census attracts wide attention, and requests therefor continue throughout each year.

Traffic reinventory in Mineral and Esmeralda Counties was completed in 1953, and immediately thereafter similar work was commenced in Churchill County with completion being effected in May 1954.

A State-wide traffic reinventory was commenced during the last month of the biennium, the schedule indicating that full coverage of the State will consume a 2-year period. Two men are engaged on the field work, and 60 portable recorders are involved.

FINANCIAL

Fiscal Survey.

The local fiscal study involves keeping current a systematic compilation of county and municipal road and street receipts and disbursements, together with debt status. A method of very accurate accounting procedure has been established for this important phase of planning activity through regular personal contact with the many county and city offices.

A study commenced during the biennium deals with the total highway fiscal structure. Its completion will provide a clear-cut accounting of the highway investment in each county by all participating agencies of the government.

Road Life.

The prime objective of the road-life unit is a current inventory of physical changes in all State-interest roads. This involves compilation of factual data on length, width, surface, type, year built, improvement and retirement records, and cost studies.

A complete road life and cost study of the U. S. 395 (California-Nevada State line near Topaz via Gardnerville, Minden, Carson City, and Reno, to the Nevada-California State line near Purdy) was commenced during the biennium.

Compilations under the road-life studies included:

First edition of a complete Federal-aid Secondary Road Log.
Revised Description of the Federal-aid Secondary System.
RL-7 Graphs for Federal-aid Secondary Routes and non-Federal-aid State Routes.
Revised Control Section Index.

Statistics.

Kept current in this phase of the study are a multiplicity of valuable compilations dealing with State and local mileages, highway costs, and road-user revenues.

Our monthly tables and graphs on motor vehicle registration and revenue and on motor fuel consumption and revenue are watched with considerable interest by reasearch organizations and oil companies. Modern photographic and multilithic processes have made possible the innovation of presenting these compilations in colors, thus permitting interpretation with a minimum of study.

The fiscal, road life, and statistical phases of the financial set-up dovetail into an over-all picture of the economic factors governing intelligent highway administration, road-life expectancy, current needs, and long-range programing.

SPECIAL STUDIES

Of particular interest to people living in the State of Nevada was a State-wide motorist survey conducted over a 3-month period, June, July, and August, in 1952, the purpose being to determine the travel habits of out-of-State motorists and, by analyzing the data obtained, to develop facts to be used for future planning purposes.

Twelve interview stations were established at the more heavily traveled points of exit from the State. Expansion of information derived from personal interviews at these points indicated that 2,232,340 out-of-State vehicles carrying 6,451,375 passengers passed through or spent time in the State, and that the average expenditure was $229,900 per day, or an estimated total expenditure of $83,913,500 on the annual basis.

A very comprehensive report of the survey is available.

A study which could be of far-reaching import was one which had its origin in a Presidential Executive Order. In that Order, the Industry Evaluation Board, under direction of the Secretary of Commerce, was charged with the responsibility of establishing security ratings of critical facilities based on relative importance thereof to defense mobilzation and production, and essential civilian economy. The Order also provided that upon completion of the over-all survey, the appointed agency should submit a composite report to the National Securities Research Board.

Participation by the several States in the phase of the study dealing with critical highway facilities was at the request of the U. S. Commissioner of Public Roads. Data supplied conformed to queries posed in a prepared questionnaire, one being used for reporting on each critical facility.

One of the continuing studies of the biennium concerned a second revision of certain compilations emanating from a provision of the Federal Aid Highway Act of 1948, whereby the U. S. Commissioner of Public Roads was directed to cooperate with the State highway departments in a study of the status of improvement of the National System of Interstate Highways.

Still another continuing study, conducted each year of the biennium, was the highway maintenance cost study required by the U. S. Bureau of Public Roads. Eleven sites were selected several years ago for study on progression of deterioration. Features considered for the purpose of determining maintenance costs are surface type, thickness of surface, base and sub-base, and sub-soil classification.

Annual and quarterly truck-weight studies were routine, as were annual speed and car-occupancy studies.

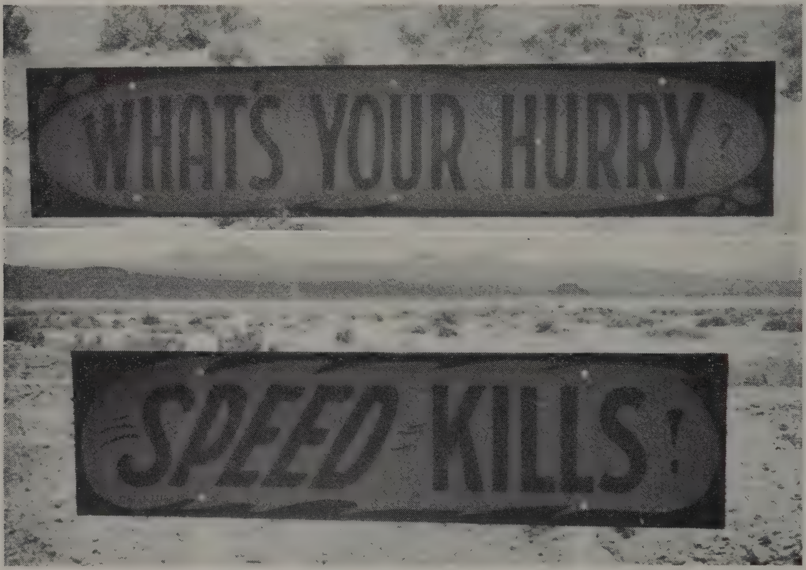
Many intersection and turning movement studies were conducted following requests from communities faced with perplexing intersection and signing problems. Such studies consist of traffic counts, consideration of prevailing speeds and turning movements, accident history, and conformity of vehicular and pedestrian volume to certain warrants set up by a special committee of the American Association of State Highway Officials. The combined data assist in solving the problem of the involved community and provide important points to be considered from an engineering viewpoint in roadway design.

TRAFFIC AND SIGNS

The Division of Traffic and Signs, headed by the traffic engineer, is responsible for centerline striping, and the production and placing of signs and traffic control devices on the improved State highway system.

Center striping is done in accordance with standards recommended by the American Association of State Highway Officials, and consists of a dashed, or broken, white centerline with a solid yellow barrier or no-passing line. Increasing volume and speed of traffic has created more need for centerline striping and the Department is now striping 3,200 miles of highway annually, at a cost of about $90,000. In addition to centerlining State highways, some striping is being done for counties and cities, for which the Department is reimbured. Additional pavement markings such as STOP and SLOW are placed according to National standards.

A policy wherein performance specifications have been the determining factor for purchase of traffic paint was adopted during the biennium. Various paint samples were given rigid laboratory and field tests by the Materials and Research Division. Companies manufacturing paints with the higher ratings were then invited to bid on the volume required for one striping season.



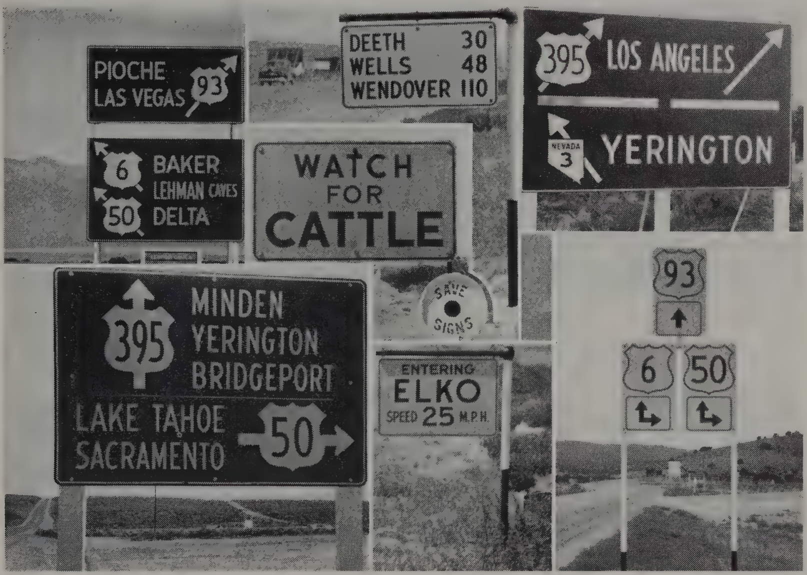
These signs, experimentally placed on US 40 between Fernley and Lovelock, are designed to make the motorist aware of the dangers of high-speed driving. Their messages speak for themselves.

All signs are manufactured in the Department's sign production shop in Reno. The majority of signs now produced are reflectorized with a reflective sheeting in order to be as effective for the night driver as the daytime motorist. Approximately $40,000 worth of new signs are manufactured each year.

Red, reflectorized STOP signs have now been adopted as standard for this State. Numerous tests, carried on by the traffic division, indicate a more positive reaction and greater obedience by the motorists to the red stop sign than to the yellow. This is probably due to the fact that the color "red" is universally associated with danger. Initial installations have been made on the more heavily traveled routes and the program of replacing the yellow stop signs will take four to five years, as the signs are changed according to maintenance requirements.

Due to increased speed, we are now erecting "oversize" signs at many of the more important junctions in order to give the motorist a better "break" and more time to decide in which direction he wishes to travel. Warning signs, to indicate an intersection or junction, are now being placed one-half mile in advance. Although it is believed that Nevada highways are well marked, nevertheless, the Traffic and Sign Division is continually attempting to improve these markings in order to keep up with traffic requirements.

The ever-increasing traffic volumes have brought demands for additional signals and other traffic controls. These demands are usually reviewed by the Traffic Engineer as to their justification, and during the past biennium traffic signals were installed at four intersections where traffic volumes warranted. The policy covering such installations requires that the intersection consist of two State routes with sufficient traffic to meet the "warrants" established by AASHO. Such installations have been a joint venture, with the Department designing and installing the system and the respective county or city agreeing to maintain them.



Improvements are constantly being incorporated in sign design and placement. Shown are scotch-lighted directional and informational signs, installed at higher levels and in larger size to give greater readability. Pipe standards are used for longer life.

We have also installed numerous mercury vapor lighting systems at channelized intersections under the same type of agreement as the signal installations. The lighting systems have proven very satisfactory as an added safety measure for the traveling public. Our policy, now

Before and after. Lower picture shows the same bridge, five years later. Replacing untreated wooden piles is a costly part of bridge maintenance.

in effect for highway lighting, is: "All channelized intersections shall be illuminated, provided power is available." We do have several isolated areas where power is not readily available.

Since our greatest loss to highway signs is through shooting, we adopted a plan of attaching a target to the signs in areas where shooting was prevalent. The targets are made from the lids of five gallon paint cans, given one coat of white paint, and with the legend and bulls-eye placed with a stencil. Since we purchase our traffic paint in 5-gallon containers, we always have an ample supply of targets on hand, and the cost amounts to only a few cents each. This practice has attracted Nationwide attention and the shooting of signs has been materially reduced in the southern and eastern sections of the State.

Traffic engineering services have been furnished to the majority of the cities of the State and in some instances, in cooperation with the Planning Division, extensive traffic studies have been conducted to provide the cities with factual data concerning their traffic problems.

BRIDGES AND GRADE SEPARATION STRUCTURES

A large part of the bridge construction during this biennium has been the replacing of timber bridges with more permanent-type structures. Timber bridges have required a more costly maintenance than other types.

The Bridge and Grade Separation Summary, Table No. 11, shows a decrease of 11 timber bridges. There was formerly a series of six west of Caliente on U. S. 93, two of which were replaced by reinforced concrete boxes of bridge size, and two by reinforced concrete boxes of culvert size. Two were eliminated by a channel change. On U. S. 95, south of Fallon, two timber bridges were replaced by reinforced concrete slab spans. On State Route 37, south of Minden junction, timber bridges over the West Fork of the Carson River, the Home Slough, and the Cottonwood Slough were replaced by concrete slab spans.

Four reinforced concrete boxes of bridge size were constructed, one on U. S. 93 north of Wells providing for a 32-foot roadway over the Thousand Springs Creek, one over Coleman Creek north of Paradise Valley, one on the new alignment of State Route 23 northwest of Gabbs, and one on the new alignment of U. S. 50 widening to four lanes the Taylor Street Bridge at the south edge of Fallon.

The new bridge over the Humboldt River near Carlin is one of unusual design, saving considerable concrete and weight. This was accomplished by placing the main reinforcing steel in the T-beams in bundles of four bars each, allowing the reduction in thickness of the beams from 21½ inches to 14 inches and producing a saving of 43 cubic yards of concrete and 4,000 pounds of reinforcing steel, at a savings in cost of $3,600.

The total cost of the construction of bridges during this biennium is approximately $280,000.

In addition to the construction, designs and drawings have been completed for three large structures. On the extension of Kietzke Lane between Reno and Sparks there is to be a bridge over the Truckee

Before and after. Old style bridge was a debris catcher. New design provides ample clearance during high water. The same scene, taken from opposite angles.

River and an underpass under the Southern Pacific tracks. In Clark County, on the new location for U. S. 91 west of Mesquite, there is to be a new bridge over the Toquop Wash.

Detail of slope paving at bridge abutment. Designed for improved waterway, lessening the chance of debris piling up during high water.

COMMUNICATIONS DIVISION

As this biennium opened, studies were underway to determine the feasibility of using radio communications in the construction and maintenance of Nevada's highways.

The study was made with the assistance of engineers representing major manufacturers and with radio equipment tuned to assigned frequencies for use in Nevada. A portable base station was set up at various locations throughout the State and coverage was mapped as vehicles, also radio-equipped, travelled the highway system. Other State highway departments with experience in radio were queried and their answers taken into consideration in the final report. Tabulations were obtained from other States purchasing similar equipment and estimated costs were calculated. The study completed, a system was planned for initial and experimental installation, specifications were prepared and approval of the project was granted by the Highway Board of Directors. In January 1953, bids were opened, and, on the basis of low bid, a contract was entered into with the Radio Corporation of America by the State Purchasing Director.

In April, installations were completed and the system was in operation. Local base and control stations were installed at the Carson Headquarters and at the Reno Plant. Local base stations were installed at Eastgate and Petersons maintenance stations, and 22 vehicles were equipped. By means of a remotely operated relay station on Mt. Davidson, communications were possible from either of the two control stations, Carson City and Reno, to vehicles operating on roads throughout Division Two. Coverage was adequate in the western area, particularly on those roads affected by snow and ice, thus enabling frequent reports of road conditions.

These reports not only made it possible for better and more efficient deployment of men and equipment, but also provided an unprecedented service to the public in making available authentic, up-to-the-minute information.

During the summer of 1953, additional studies were made in Division Three. A system was planned that would permit point-to-point communications between the Elko (Division Three) headquarters and Reno Plant and Carson City, as well as with radio-equipped vehicles operating on those routes in the Division west of Elko.

Relay station sites were obtained on top of Winnemucca mountain and Emigrant Pass. Houses were constructed, equipment purchased and installed, and final tuning and adjustments were in progress as the biennium closed.

Radio, although available only a few months during the last two years, has proven its worth. The public, through press and radio releases, has demanded more and more exacting reports concerning road conditions during the winter storms. Section foremen, operators of snow-removal equipment, and division supervisory personnel, all equipped with mobile radios, have been able to supply this information as they operate over the highway system. Repairs of equipment breaking down on the road formerly meant considerable time loss due to lack of facilities to report the breakdown. With radio, these reports are made immediately, a mechanic dispatched, and, if need be, parts ordered, with a minimum amount of time lost. Headquarters personnel, and division supervisors formerly were out of touch with their respective offices as long as four to eight hours, or more, each day. Thus, matters requiring their attention were set aside until they returned, usually the following day. With radio, much administrative business is conducted even though the principals are miles from their headquarters, thus avoiding the delays previously existing. Often, these men, in the past, were required to retrace their steps the following day, spending many hours in travel, to take care of an item requiring not more than a few minutes of time.

The Communications Division is charged with the responsibility of preliminary studies for radio installations, purchasing and installation of approved projects, and the maintenance and operation of the equipment, once installed. This is accomplished with the aid of two radio technicians, one stationed at Reno, the other at Elko. Two full-time operators handle the major portion of communications originating in either Carson Headquarters or the Reno Plant. The division is under the direction of a Communications Supervisor, with headquarters at Carson City.

MATERIALS TESTING AND RESEARCH

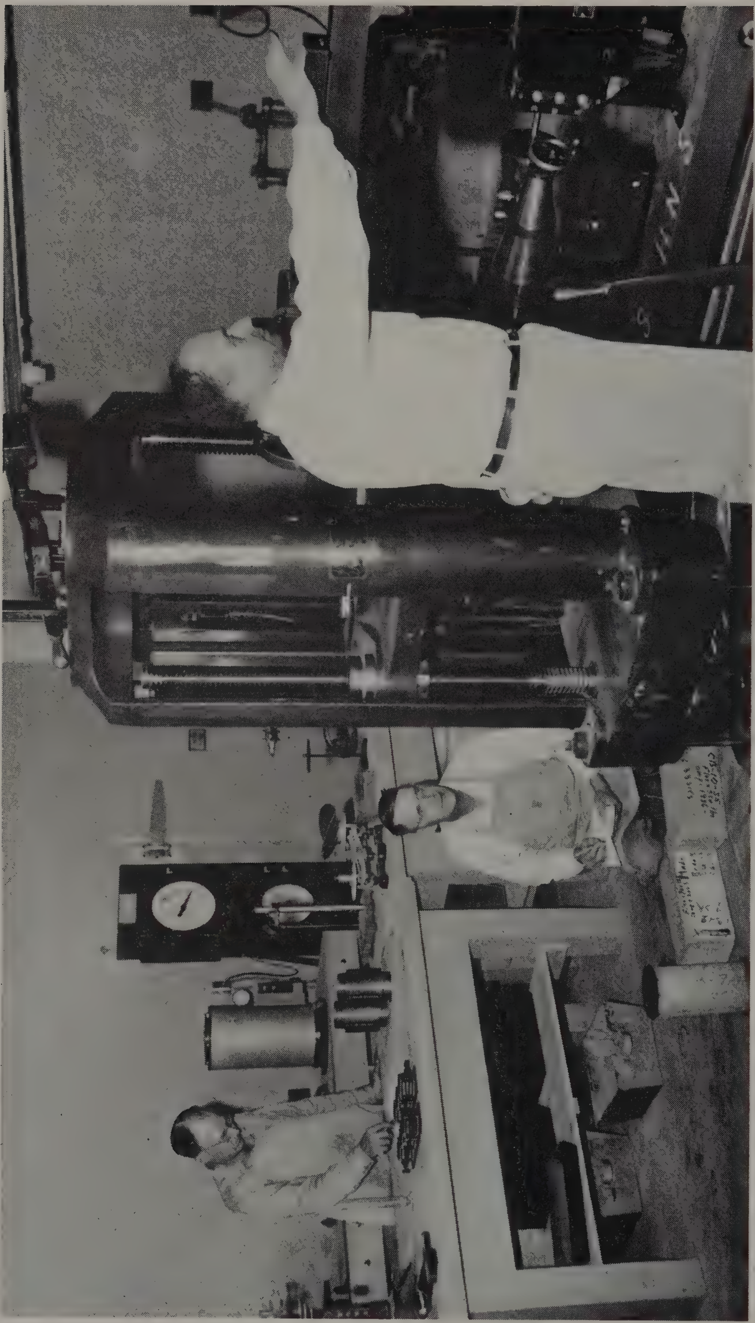
Thirteen thousand three hundred and twenty-nine samples of highway and other construction materials were tested in the Laboratory at Carson City during the 1953–1954 biennium. This figure is about 40 percent greater than the 9,519 samples tested during the 1951–1952 biennium and reflects the increase in highway construction during the last two years.

Approximately 90 percent of the samples represent highway materials used in construction and maintenance of State highways. About 10 percent represent materials used in Highway Department buildings and other public buildings, and in road, street, airport and other construction by counties, municipalities, the U. S. Navy Department, Civil Aeronautics Administration, U. S. Bureau of Public Roads, U. S. Bueau of Land Management, U. S. Indian Service and others. Nominal charges are made for testing materials proposed for use by agencies other than the Highway Department.

The 13,329 samples represent only those materials tested in the Headquarters Laboratory at Carson City. A breakdown of the samples into material types is shown in the table at the end of this report. In addition, in the 2-year period, many thousands of samples of local roadway materials, such as embankment, borrow, gravel base, gravel surface, plantmix surface, screenings and concrete aggregates were tested in the field control laboratories which are in operation on all State highway contracts. The field tests are made to insure "on-the-job" control of these items at the time the contractor is actually preparing them and placing them on the roadway.

The Materials and Research Division functions as a coordinating agency for control and acceptance of materials used in construction and maintenance of highways. Briefly, the principal duties are:

1. To make materials surveys which cover investigations of subgrade and local aggregate sources;
2. To test and evaluate materials survey samples in order to establish a roadbed design adequate for the types of traffic and climate for each particular section;
3. To train and supervise the personnel in testing and inspecting the job site processed materials, such as subgrade, gravel base and surface, plantmix surface, concrete, etc.;
4. To inspect and test all prefabricated materials such as structural and reinforcing steel; vitrified clay, concrete, and corrugated metal pipe; portland cement; timber and timber preservatives; paints and many others;
5. To investigate trouble spots, ascertaining the cause and making recommendations for correction;
6. To carry on research and special projects which may lead to improvement of test equipment and test methods and to better evaluation and use of new and old products.



Material samples being tested for conformance with specifications. Two hundred thousand pound testing machine determines strength of portland cement, concrete products, steel, etc. In background, concrete specimens are prepared for other tests.

Other duties of the Materials and Research Division include serving on National committees of the Materials Section of the American Association of State Highway Officials, acting as correlator for the Highway Research Board and serving as the official U. S. Weather Station Observer for Carson City on a voluntary basis.

In order to keep abreast of increased highway construction, several pieces of supplementary equipment have been added during the biennium for both field work and routine test work performed by this Division. For the field work these include the following new equipment items: a three-eighths cubic yard truck-mounted back-hoe, for prospecting and developing aggregate deposits; an Acker drill for foundation exploration; a one-ton panel truck which is used as a mobile laboratory office and field test equipment carrier; and a 4-wheel-drive station wagon for carrying field personnel, tools and accessories (this is a replacement).

Base and surface aggregates weighed and seived for quality. Materials used in road construction are continuously checked for specification conformity.

Supplementary equipment installed in the Headquarters Laboratory includes a new 4-tube Saybolt Furol Viscosimeter, a new water-bath with magnetically operated temperature control, and a new de Khotinsky type oven to determine loss-on-heating of asphalts. In addition, improvements were made in the lighting of some of the Laboratory rooms and a few pieces of furniture were purchased.

Special projects undertaken during the biennium were somewhat limited in quantity and scope due to press of routine tests required by the increased construction program. However, considerable work was done using portland cement to overcome plasticity in roadbed gravel on one section of highway proposed for new construction. Two projects dealing with portland cement concrete were undertaken, one of which (a study of fine aggregate blends to improve concrete in the Reno area) was continued from the 1951–1952 biennium. The other project involved a limited study of the effect of certain additives on compressive and flexural strength of concrete. An improved flash tester was designed in the Asphalt Laboratory. The new instrument makes possible the testing of two samples at one time by use of a special pilot light and a pivoted free-moving test flame tube.

The number and kinds of samples tested at the Headquarters Laboratory in Carson City during the 1953–1954 period are shown in the following table:

Asphaltic products section. Rear, viscosity testing; center, weighing; foreground, recording and computing. Complete test records are kept on all materials sent to laboratory.

Concrete Materials—	
Portland Cement	76
Coarse Aggregate	143
Fine Aggregate	148
Water for Concrete	5
Concrete Cylinders (from Field)	2,766
Concrete Cylinders (4 x 8 Lab.)	206
Curing and Waterproofing Compounds	6
Expansion Joint Filler	12
Concrete Pipe for Percentage of Absorption	4
Air Entraining Agents	9
Rock for Grouted Rip Rap	12
Concrete Pipe	1
Concrete Building Blocks	46

Gravel Base, Gravel Surface and Fill Materials other than Soil—	
Gravel Base and Surface (preliminary or pit samples)	1,115
Gravel Base and Surface (finished product)	626
Screenings and Chips for Seal Coat	40
Slag and Cinders	3
Selected Borrow	97
Drain Backfill	4
Soils—	
Subgrade Samples, Highways and Airports	1,880
Moisture Tests on Subgrade Material	8
Metallic Materials—	
Corrugated Metal Culvert Pipe	1,211
Mesh Reinforcing	3
One-half inch Cable	1
Three-fourths inch Strap Metal	1
Barbed Wire	9
Wire Fencing	9
Reinforcing Steel	156
Structural Steel	53
Bituminous Materials—	
Liquid Asphalt, RC-2	1
Liquid Asphalt, MC-1	157
Liquid Asphalt, MC-2	182
Liquid Asphalt, MC-3	15
Liquid Asphalt, SC-2	5
Liquid Asphalt, SC-3	1,011
Liquid Asphalt, SC-4	366
Liquid Asphalt, SC-6	256
Penetration Grade Asphalt—	
85–100	90
100–120	159
120–150	463
Emulsions, High Viscosity	358
Emulsion Mix	27
Bituminous Treated Aggregate for Extraction Tests	466
Miscellaneous and Special—	
Vitreous Pipe	1
Pressed Fire Clay Face Brick	16
Creosote For Timber Preservative	6
Paints	82
Miscellaneous Unclassified Special Tests	11
Abrasion on Plantmix Material	2
Plantmix Bituminous Aggregates	15
Special Tests to Determine Oil Percentages of Base and Surfacing Aggregates	550
Centrifuge Kerosene Equivalent (C.K.E.) Test to Determine Oil Percentage Ratio of Base and Surfacing Aggregates	195
Treated Aggregate for Stabilometer Tests	110
Special Tests on Base and Surfacing Aggregates (combining pit preliminary samples for stability and oil ratio percentage tests)	65
Sand Equivalent Tests	50
Sand Percentage Tests	20

EQUIPMENT

The Equipment Division, completing the biennium of 1952–1954, has replaced 171 major units. This equipment, acquired through the State Purchasing Director on a competitive bid basis, has shown considerable saving to the Highway Department.

Purchased through trade of old equipment and some outright, as additions to the fleet, were: 40 pickups, 50 trucks (3- to 5-ton class), 22

Like Topsy, the Reno Equipment shop just grew and grew! Constructed in 1922 to handle vehicles of the day, this plant now is the center for all major overhaul of the highway fleet. The need for new and properly designed shops is apparent.

passenger cars, 14 front-end loaders (pneumatic tired), 5 motor graders, 6 rollers, 1 shovel (3/4 yard capacity), 2 traction brooms, 2 street flushers, 1 tractor and loader, 1 distributor, 2 impactors, 1 compressor, 1 spreader box, 16 snow plows, 1 rotary plow and truck, 3 portable bunk houses, 3 trailers (single axle 8- to 10-ton capacity).

This division, in the way of construction, enlarged the Carson Shop to accommodate maintenance office and radio base and control stations for the Highway Department and State Highway Patrol; divided Reno Plant office, making room for radio base and control stations; and erected wooden poles at Reno, Carson, Eastgate, and Peterson Flat for installing antennas for radio stations at these points.

Employees of Reno Plant leveled the site and constructed a radio relay station on Mt. Davidson; enlarged the Reno Shop by two thousand square feet of floor space, thus improving the facilities for handling the many large units which are repaired in this building; installed a new 8-inch water line from the city main into the Reno Yard with three additional fire hydrants; and installed fire alarm boxes with direct connection to Reno Fire Station.

Three small units for bachelor living quarters at maintenance stations were built at the Reno Plant and moved to Division Three for North Fork, Orovada, and Denio. These were completely equipped with bedroom, bath and kitchen.

The Virginia City maintenance garage was remodeled for temporary use with installation of compressor, lights and service equipment. Permanent tanks and pumps for gas and diesel fuel were installed. A modern structure should be constructed at this site in the near future.

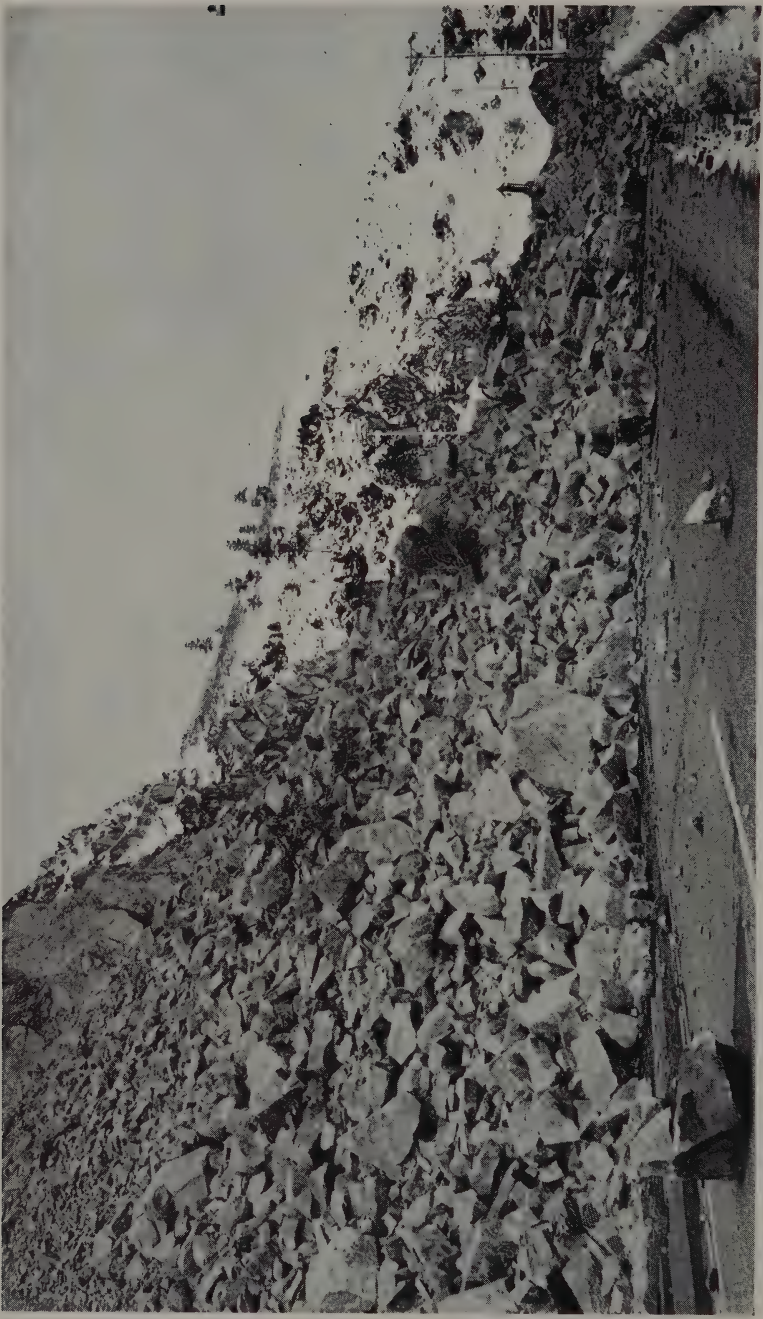
Garages at Bowers, Fallon, Yerington, Spooners, Fernley and Schurz have been equipped with oil furnaces and new brick chimneys. During the winter, snow and ice are easily removed in these heated structures, making the units accessible for emergency repair work by mechanics from the Reno and Carson Shops.

The Equipment Division has 68 employees throughout the State to maintain over one thousand mobile units plus the many stationary pieces such as lighting plants, pumps, compressors, furnaces, steam boilers, lathes, presses, power hammers, welders and various other shop tools and equipment.

Throughout the State many new structures have been built by contractors on bids awarded by the Highway Department. These are maintenance stations and garages, a boon to both the Maintenance and Equipment Divisions in handling and repairing equipment.

At the maintenance division headquarters there are spacious and well-equipped shops with a well-kept stockroom and accurate records of all parts and supplies received and disbursed. The perpetual inventory card system makes it possible to keep the necessary parts and supplies on hand for seasonal work.

Winter snow removal, spring, summer and fall construction, oiling and engineering equipment each require varying amounts of parts, supplies and repair in order that the work might be performed with as little delay as possible.



Sunday, February 14, 1954, 6:30 a.m. Highway Maintenance received reports that "US 40 is blocked by rock slide near California-Nevada line."

CONSTRUCTION

During the biennium, July 1, 1952 to June 30, 1954, 60 contracts were awarded covering the construction or reconstruction of 488.32 miles of road at a contract cost of approximately $13,171,510.

Of these 60 contracts, 42 were completed covering 271.64 miles at a cost of $6,030,106. Contracts under way but not completed on June 30, 1954, numbered 18, covering 216.68 miles at an estimated cost of $7,141,404.

In addition to the above, 31 contracts awarded prior to July 1, 1952 covering 377.7 miles at a cost of $5,526,689 were completed during this biennium.

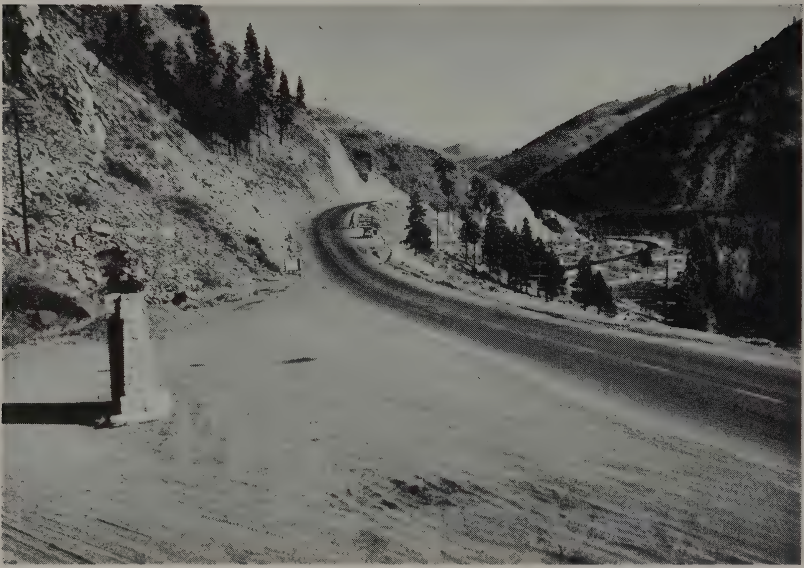
Of these 60 contracts awarded, 2 covered the construction of 8.81 miles of 4-lane divided highway in Washoe County at an estimated cost of $2,091,141; 12 were for the construction of 112.2 miles of 2-lane plantmix asphaltic surface; 22 were for the construction of 205.5 miles of roadmix asphaltic surface; 5 were for 114 miles of widening and resurfacing with plantmix asphalt; 4 were for 34.7 miles of gravel surface; 2 were for the construction of 10.5 miles of mine access road financed entirely with Federal access funds; 1 was for 2.6 miles of clearing right of way; 8 were for the construction of highway maintenance buildings at Wells, Pequop Station, Emigrant Station, Schurz, Fernley, Eastgate, Petersons, Mina and Tonopah at a total cost of $526,441, financed entirely with State funds; 2 were for construction of airports at Ely and Pioche at a cost of $46,660, financed jointly by the Civil Aeronautics Administration, the Nevada State Airport fund, and a sponsor, either the city or county; 1 contract was for the installation of traffic signals on Main Street in Las Vegas; and 1 was for the removal of trees on Carson Street in Carson City.

Contract No. 864, for the reconstruction and widening of 28.93 miles of U. S. 93 north of Wells in Elko County, at a contract amount of $1,268,295, was the largest single contract ever awarded by the Highway Department. Other large contracts awarded during the biennium were: Contract No. 849 for the widening and resurfacing of 57.73 miles of U. S. 95 between Las Vegas and Camp Desert Rock in Clark and Nye Counties, at a final contract cost of $581,215; No. 850 for the construction of 2.95 miles of U. S. 91 in Clark County at a cost of $454,450; No. 861 for the construction of 2.46 miles of 4-lane highway from the California State line to 1 mile southwest of Verdi at a cost of $899,805; and No. 889 for 6.358 miles of 4-lane highway from 3 miles to 9½ miles east of Sparks costing $1,191,335 (these last two are on U. S. 40 in Washoe County); No. 887 costing $720,252 for the construction of 10 miles of U. S. 95 near Fallon in Churchill County; No. 892, amounting to $547,430 for the construction of 19.9 miles of U. S. 93 from East Ely to the west foot of Conners Pass; No. 897 costing $497,566 for construction of 12 miles of U. S. 50 from Robinson Summit to Keystone (these last two were both in White Pine County); and No. 894 costing $416,388 covering the reconstruction, widening and resurfacing of 24.2 miles of U. S. 50 in Lyon County.

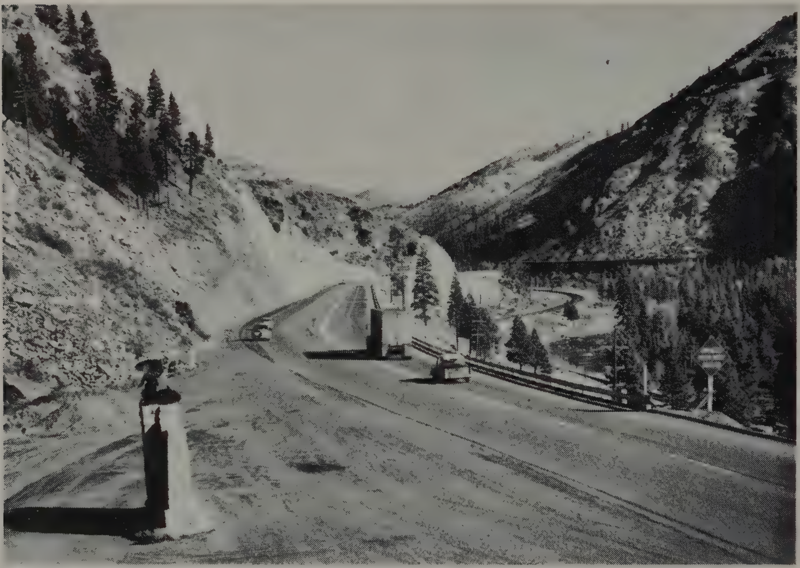
In addition to the above, the U. S. Bureau of Public Roads completed three contracts in this State during the biennium. One, costing $28,227, was for the construction of 0.6 mile of road from U. S. 50 to Nevada

Rock-removal and clean-up went on for days. Loose material and excessive overhang presented extreme danger, thus much time passed before the route could be opened to unrestricted safe travel.

A "Highway to the Sky" under construction. Rising to 8,300 feet elevation, the Rena Ski Bowl provides an unobstructed view of western Nevada and eastern California. The project, begun in 1953, was nearing completion at the close of the biennium, and will be completed, ready for use during the coming season.



The old and the new. Stateline, west of Verdi. California's 2-lane traffic merges with Nevada's first section of 4-lane US 40 across the State.



Beach, Lake Tahoe; one amounting to $278,324 was for the construction of 2.25 miles of U. S. 50 from Cave Rock to Glenbrook in Douglas County; and the third was for the construction of 4.16 miles of U. S. 93 over Conners Pass in White Pine County, the estimated cost of which is $575,000. The construction costs on these Bureau of Public Roads jobs are financed entirely with U. S. Forest Highway funds. However, all maintenance costs of these roads is borne by the State of Nevada.

A method of rehabilitating old narrow pavements is now being used which greatly simplifies the design work necessary, and consequently, lessens both the time and cost of preparing such work for contract. This method consists of trenching along the sides of old pavements, filling the trench to the elevation of the top of the old pavement with a lean plantmixed asphaltic material and then covering the full width of old and new pavement with a layer of new plantmixed asphaltic surfacing. This method is now being used wherever the features of grade, alignment and graded roadbed width are satisfactory.

The first such job was Contract 849 on U. S. 95 in Clark and Nye Counties, mentioned above. Incidentally, we have been advised by the Asphalt Institute that this job entailed the use of more asphalt than any other single highway contract ever let in the Western States. Some 8,000 tons of asphalt were used.

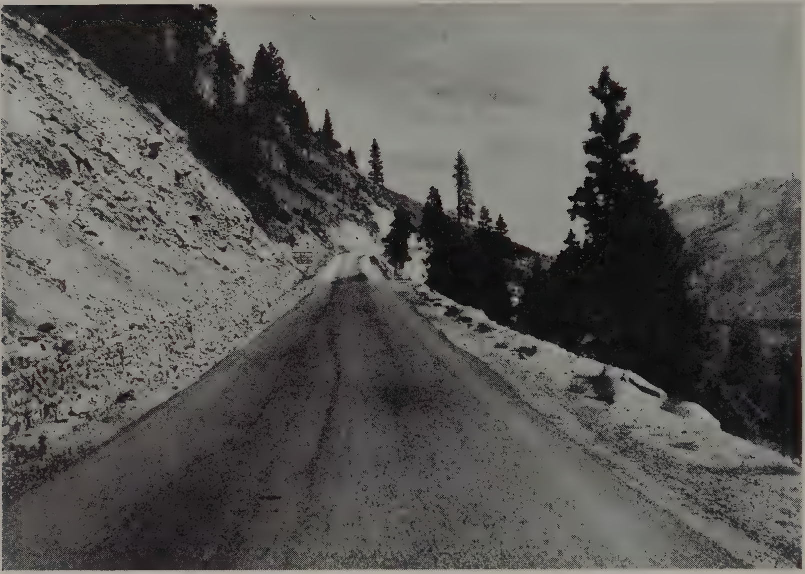
Other such jobs were the section of U. S. 50 from the California State Line to Cave Rock in Douglas County; a 24-mile section of U. S. 50 from 2 miles east of Dayton to 2 miles east of Silver Springs in Lyon County; an 18-mile section of U. S. 50 from Campbell Creek Ranch to Railroad Pass in Lander County; and from Galena Creek to the junction of S. R. 27 and U. S. 395, a distance of 6.8 miles. More miles of this type of work will be constructed in the near future.

Another construction feature now being used is the widening of the roadway for several hundred feet at the top of all major summits. This provides room for trucks to park off the roadway to check tires and brakes before descending the grade.

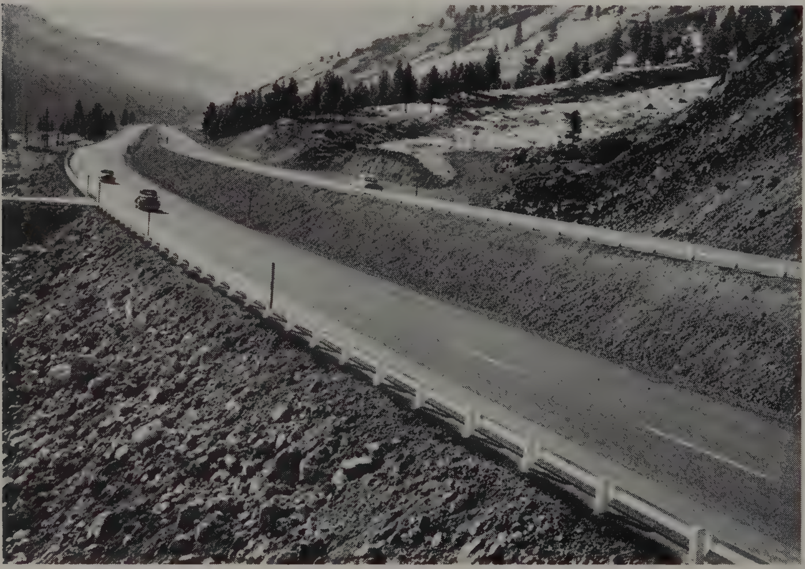
Several small roadside parks and rest areas have been constructed during this biennium and from observation it is quite apparent that these facilities are well used and appreciated by the traveling public, particularly tourists from out of State. In addition to Crystal Peak Park on U. S. 40 near Verdi and Geiger Lookout on S. R. 17, which have been in use several years, other such facilities of various types have been established along U. S. 40 east and west of Lovelock, west of Winnemucca, in Carlin Canyon, east of Pequop Summit, and at the top of the hill west of Wendover. From this latter point the curvature of the earth is plainly visible across the level lake bed to the east in Utah. This is one of the few places on the earth's surface where its curvature can be observed on land. Other rest areas have been established at Millers and Lathrop Wells on U. S. 95, near Arden on U. S. 91, north of Glendale on U. S. 93, and at Scott Summit east of Austin on U. S. 50.

OBSTRUCTION OF NATURAL DRAINAGE CHANNELS

In areas where land adjacent to the highway is being improved for building purposes the Highway Department is experiencing more and



Looking easterly, this 2-lane, short sight distance road was remodelled to provide safe, 4-lane, flat curved highway, as shown in the reverse view.



more difficulty and expense due to the practice of the individual property owners of leveling their land and thus filling up the natural drainage channels that may traverse their holdings. At times of heavy rains the runoff is thus diverted from the culverts that have been placed in these natural channels. Eventually this runoff water concentrates at some point in amounts much greater than anticipated, with the result that the culvert does not carry the water and the road is overflowed, with consequent washouts and expense of repair as well as extreme danger to the traveling public.

The problem of roadside cleanup and litter removal is an ever-increasing one. Many thousands of dollars are spent each year in trying to keep our roadsides from looking like a public garbage dump. This problem is particularly acute along highways near the larger centers of population, it appearing that a great many people consider that the roadside ditches are constructed especially to act as receptacles for their beer cans and other rubbish.

DIVISION ONE

Division One, with headquarters at Las Vegas, was quite active during this biennial period in construction and maintenance activities. Fourteen contracts were let totaling $3,069,090, all being completed except one in the Pahrump Valley.

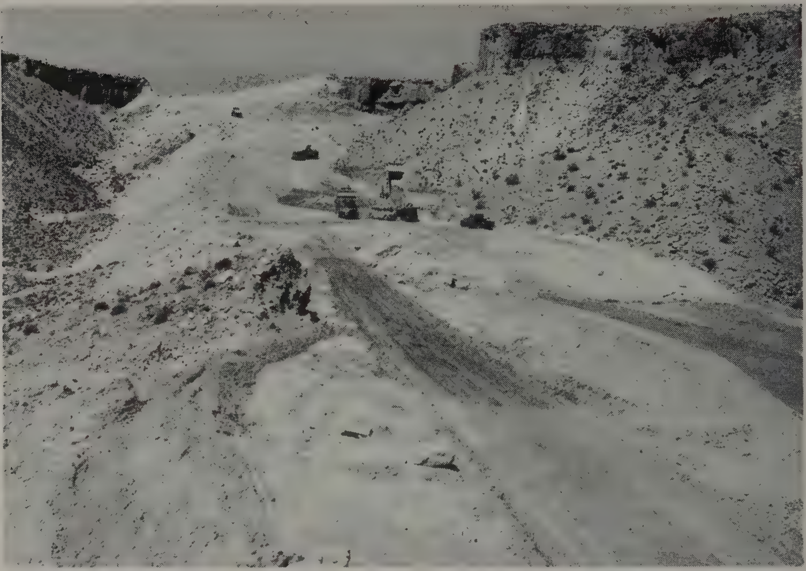
Fifty-one miles of new construction, all in the Pahrump Valley, were added to the Division mileage during this biennium. This construction amounted to $628,710.

One of the largest and most intricate grading jobs let in the State during recent years was the grading of Contract 850, on the east slope of the Mormon Mesa. This contract, by Isbell Construction Company, consisted of a novel construction of benched cut-slopes through a rock and sand cut (253,000 cubic yards) and dropping vertically for approximately eighty feet. This bench design construction has proved very satisfactory in this type of construction. The total cost amounted to $606,550.

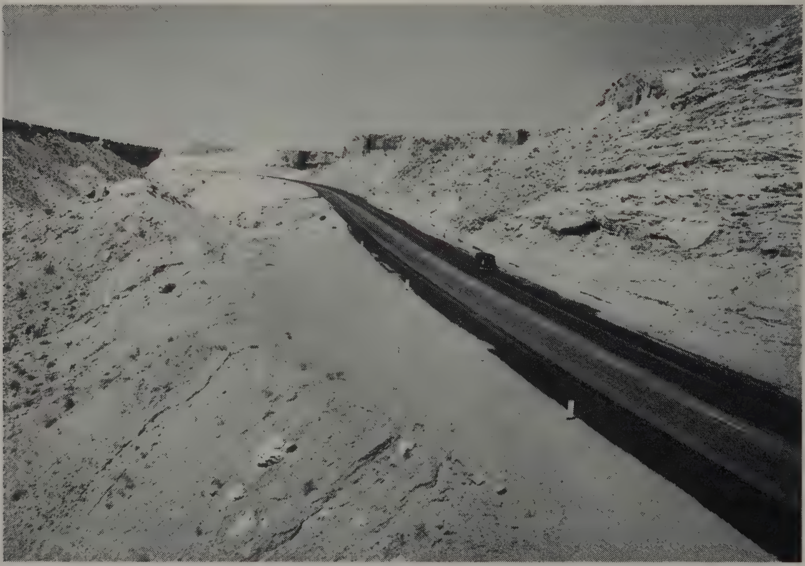
Contract 849, started in October, 1952, and completed in June, 1953, was another job of considerable interest, as the total length of 57.73 miles was the largest asphalt paving job let in the State, and in the West.

Traffic signals were installed at four busy highway intersections in the Las Vegas area at a cost of $47,586.

The major accomplishments of the maintenance forces in Division One during the past biennium consist of pavement widening and sealing, with second-story thickening where necessary, from Glendale to the end of the Division along U. S. 93. Through this distance of 87 miles, the pavement has been widened approximately three feet and the surface retempered. This additional width is a very considerable safety factor, and allows dual-tired rigs to ride with the outside dual on the pavement instead of hanging over on the gravel shoulder as was previously the case. This work was completed during the summer of 1954. Paved shoulder work has also progressed on U. S. 95 from the Mercury turnoff north to Beatty, and on State Route 12 from its intersection with U. S. 91 to near Logandale.



Mormon Mesa, Clark County. A section of newly constructed US highway 91 between Glendale and Mesquite.



Widening, US 95, near Indian Springs.

Storage garage and crew residences, Mountain Springs. Located 30 miles from Las Vegas, on the road to Pahrump, adequate facilities have been provided for both men and their families, as well as highway maintenance vehicles.

Sign erection and maintenance has become an increasing problem. A man with a pickup truck has been assigned to this work. He is hard pressed to keep ahead of the damage done by vandals. One instance noticed in the fall of 1953 was the shotgun blasting of each sign on the right-hand side of the road from Glendale to Pahranagat Lake. It took lots of shells, but the "character" left his mark on every sign.

Guardrail has been placed by maintenance forces at two points of high accident incidence. Near Erie on U. S. 91 there had been several fatal accidents so a guardrail was placed on the outside of the offending curve. No trouble has been noted there since the guardrail was installed. Another section of guardrail was placed at a right-angle curve on the temporary connection leading to Las Vegas Heights. Several tipovers had occurred at this point. Since the guardrail was built, several cars have hit the rail but there have been no upsets. Several oversize warning signs have been placed at dangerous points. The standard-size warning signs did not command sufficient attention.

The Clark County Road Department has been spending a portion of its gas tax money constructing and oiling feeder roads throughout Las Vegas Valley. Their construction has largely followed section lines, and consequently there has been a number of feeder roads joining State highways on a diagonal. The County has cooperated in squaring up their approaches where they join the State highways.

A start has been made on providing off-road parking places for the tourist. The maintenance station at Lathrop Wells has been discontinued, but arrangements have been made for the continued watering of the trees growing at this site, and the old station grounds have been opened to the public as a rest area. An old, cased well existed on the highway right of way about 12 miles south of Las Vegas on U. S. 91. A windmill was set at this well and several trees planted, to be watered from the well. The trees are still too scrawny to be attractive, but it is hoped that they will eventually provide greenness and shade for the summer traveler. North of Glendale on U. S. 93 a grove of trees has been planted with arrangements being made with a local rancher to furnish the water for irrigation. Wooden picnic tables were placed at two shady spots near Mesquite. One picnic table disappeared shortly, but those remaining are getting enthusiastic use by the travelling public.

Two pipe culvert installations subject to repeated overflows were treated with slope paving. The structure near the Nelson turnoff on U. S. 95 was paved on the downstream slope with grouted riprap. One heavy storm has hit there since, and although the water ran over the road and held up traffic for 30 minutes, no damage resulted to the roadway or shoulders. During the repaving of the roadway between Las Vegas and Camp Mercury on U. S. 95, done by contract, maintenance forces installed a double 24-inch corrugated metal pipe in a dip which carries runoff water from Mt. Charleston. This dip was quite blind, particularly for a car approaching from the north. Both the inlet and outlet slopes were paved. Plantmix was obtained from the contractor for the paving.

A considerable building program by maintenance forces in Division One has been under way during the period covered by this report. The maintenance force previously stationed at Lathrop Wells has been moved into Beatty. A garage and equipment stalls of concrete construction have been erected there. The houses from Lathrop Wells were moved to Las Vegas and Indian Springs, respectively. The house moved to Las Vegas is currently housing the Drivers License Office. The house moved to Indian Springs replaced a substandard cabin that had been there. The station at Indian Springs has been moved from a cramped location fronting on the highway to a roomy slope of ground some one-half mile westerly. This was arranged by a land swap deal by the Highway Department at no expense to the Department, trading frontage for space. At present, a cinder-block garage and storage sheds are being built on the new site. Two new asbestos shingled houses and a cinder-block garage and equipment stalls are practically completed at the maintenance station site near Mountain Springs summit on the new highway into Pahrump Valley. Water by gravity flow was obtained from a cold mountain spring at the site.

DIVISION TWO

Division Two, with headquarters in Reno, includes that portion of the State highway system in Churchill, Douglas, Lyon, Ormsby, Storey and Washoe Counties and portions of Lander, Mineral and Pershing Counties, a total of 943 miles.

Maintenance foreman's residence, Schurz. Buildings of this type are rapidly replacing unsightly, inadequate housing.

Construction work in Division Two, for the biennium, consisted of approximately 18.46 miles on secondary and 26.220 miles on primary routes at a cost of $3,558,000.

Federal-aid secondary construction contracts under way duirng the biennium were as follows:

Churchill County.

Portuguese Lane near Fallon, a length of 2.036 miles, at a cost of $42,279.

Douglas County.

Construction of three concrete bridges and approaches on State Route 3 near Gardnerville at a cost of $180,000.

Lyon County.

Construction of 2.0 miles of new highway from Smith Post Office north to the Walker River and construction of 1.25 miles of new highway from near Yerington to Slaughter House at a total cost of $84,000.

Pershing County.

Completion of 7.8 miles of new construction from Mill City to Nevada-Massachusetts Tungsten Mine at a cost of $155,595.

Washoe County.

Extension of Kietzke Lane from Airport Road southerly to U. S. 395, a distance of 1.2 miles at a cost of $99,234; and construction from Grass Lake to Slide Mountain, a distance of 2.6 miles at a cost of $213,398.

Contracts under way for construction of primary routes during the biennium were as follows:

Churchill County.

From a point 9½ miles south of Fallon to Richard Street in Fallon, a distance of 10 miles, at a cost of $720,000.

Douglas County.

Widening and resurfacing U. S. 50 from California-Nevada State line to just north of Cave Rock, a distance of 7.333 miles, at a cost of $99,000.

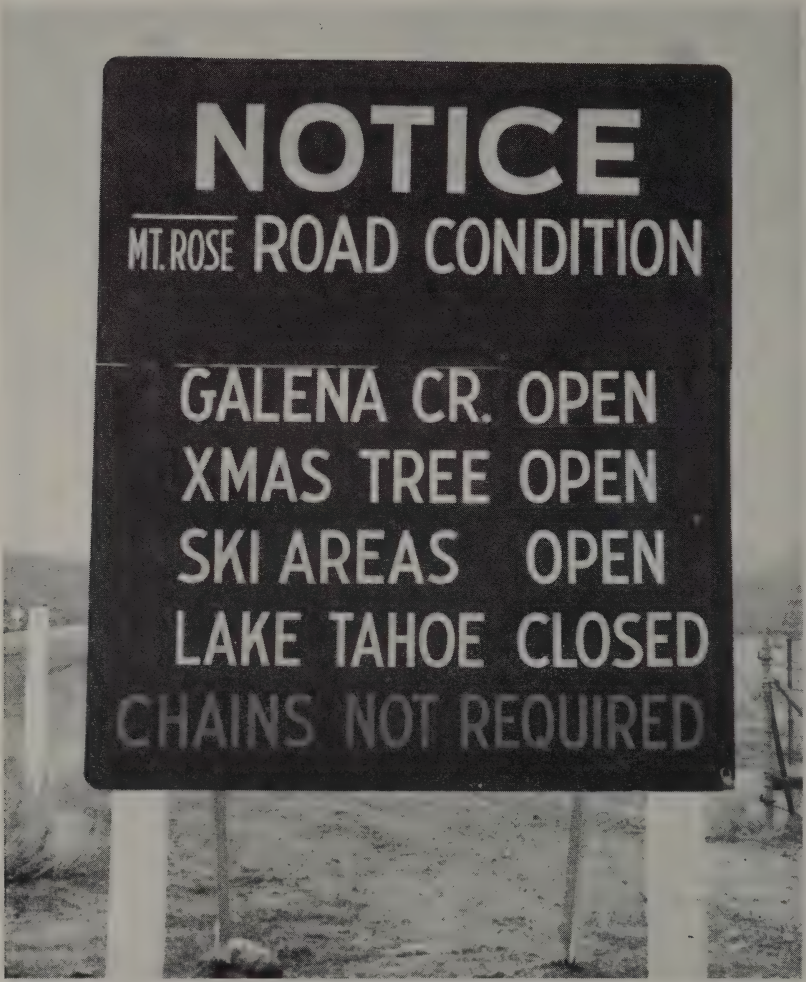
Washoe County.

Construction of two sections of 4-lane highway on U. S. 40, one section from the California-Nevada State line to 2.5 miles north-easterly at a cost of $771,200, and one section from Vista to 6.4 miles easterly at a cost of $1,191,000.

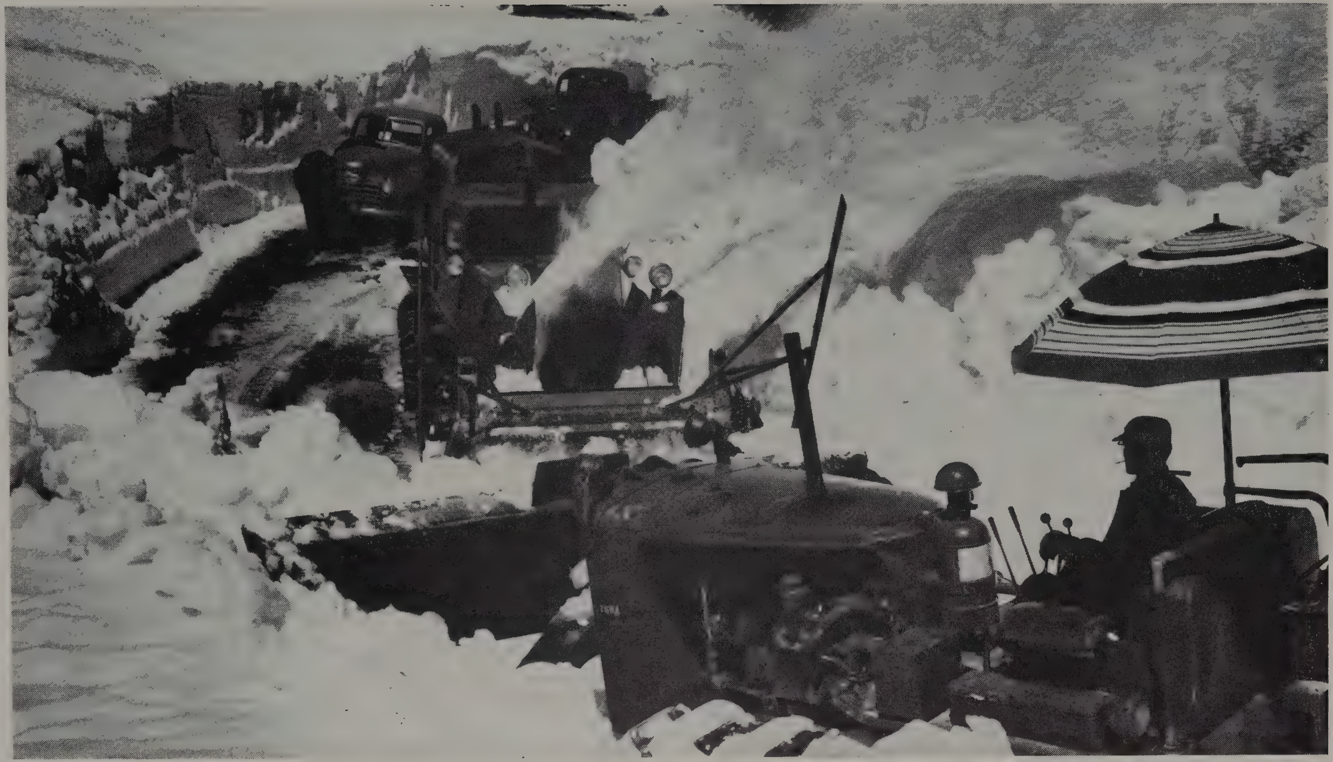
New maintenance garages were constructed at Peterson's, Eastgate and Schurz. A new house was constructed at Schurz and the garage at Fernley was enlarged.

Roadside rests were constructed at four sites on U. S. 40 in the vicinity of Lovelock. These improvements consist of a concrete table and two benches at each site. At the roadside rest 20 miles west of Lovelock a shelter was constructed above the table and benches. Trees provide shade at the remaining sites. These roadside rests are proving to be very popular with the public.

During the biennium maintenance forces applied seal and screenings to 145 miles of highway.



Located on SR 17, just west of US 395, this sign advises the winter traveler of road conditions in the winter sports area. Pictured on the opposite page is the explanation for the sign's legend, "Lake Tahoe Closed." This was the condition in April 1954. (And a "mild" winter at that!)



DIVISION THREE

Division Three, with headquarters in Elko, maintains 818 miles of State highway in Elko, Humboldt, and the northern portion of Lander, and Eureka Counties.

During the past two years, 14 contracts were awarded to contractors for the expenditure of a total of $2,591,656.92, in this Division. In addition, an access road was built from Golconda to a point 21.3 miles south at a contract cost of $21,645.34.

New facilities were constructed for our maintenance stations at Wells, Pequop, and Emigrant, which have improved living conditions for our maintenance employees, and have provided better protection for housing all the equipment in winter weather. The total cost of these improvements amounted to $120,000.

One contract was awarded for constructing 15 miles of roadmix oil surface at a cost of $62,325.17. Also awarded was a contract to seal and chip 26.89 miles of U. S. 40 from Battle Mountain to the east foot of Golconda Summit, at a cost of $48,233.97, which has greatly improved this section. Another 10.8-mile section was improved on U. S. 95, north of Orovada, by placing a new 24-foot roadmix surface on top of the old 20-foot roadmix surface, at a cost of $65,989.43.

On the secondary system, four contracts were awarded to build and oil 44.263 miles of new road, at a cost of $888,128.02.

There was one concrete bridge, 205 feet long, built across the Humboldt River, near Carlin, at a cost of $55,230.

At the Nevada-Idaho State line, on U. S. 93, a contract was awarded to build 0.63 mile to a plantmix surface at a cost of $61,713.

Signs in this Division are now being placed on 2-inch pipe instead of the customary wooden posts. The pipes are being set in concrete, thus eliminating costly maintenance resulting from frequent replacement of rotting posts.

A 190-foot well was dug at our North Fork station to insure a good supply of water. Prior to this, surface water was being used from a well 20 feet deep. Also, a concrete water tank was built on the hillside about 100 feet above the buildings.

In the past two years; this Division, with its maintenance force, has sealed and chipped approximately 38 miles of U. S. 40. There were, also, 16 miles of new fence constructed under a cooperative plan. The three parties involved were the Highway Department, which furnished the posts and staples; the Grazing Service, which furnished the wire; and the property owner who erected the fence and maintains it at his own expense.

There are 58 employees in this Division, of which 48 are on maintenance. It is estimated that there are approximately 17 miles of road to each employee on maintenance.

DIVISION FOUR

Division Four, with headquarters at East Ely, includes 377 miles in White Pine County, 99.55 miles in the southeastern part of Elko County, 96.16 miles in Eureka County, 183.45 miles in Lincoln County, and 55.35 miles in the northeastern part of Nye County, a total of 811.5 miles.

During the biennium, July 1, 1952 to June 30, 1954, the following construction projects were completed by contract with Federal-aid funds:

Elko County.

White Horse Pass to 19 miles south of Wendover on U. S. 50, 9.12 miles, 26 feet of roadmix asphalt surface.

Eureka County.

Hay Ranch to Eureka on U. S. 50, 11.2 miles of roadmix asphalt surface, 32 feet wide.

Thirty miles south to 18½ miles south of Palisade on State Route 20, 11.5 miles of 24-foot roadmix asphalt surface.

The Lander-Eureka County line to 12.12 miles east on U. S. 50, placed two inches of roadmix asphalt surface, 24 feet wide.

Lincoln County.

Constructed a drainage and flood control system north of Caliente on U. S. 93. Also, replaced six wooden bridges with four concrete structures and made channel changes for flood control from Caliente to 5 miles west on U. S. 93.

Fifteen miles to 31 miles north of Pioche on U. S. 93, plantmix asphalt surface, 26 feet wide for 16 miles.

From 10¼ miles north of Pioche on U. S. 93 to the Monarch Mine, grade and gravel, 5 miles on a mine access road.

Comet Mine to 5.5 miles south, grade, gravel, and drain, 5.8 miles on State Route 83.

White Pine County.

Junction of U. S. 6, near east foot of Connors Pass, north to Piermont Creek in Spring Valley, 32.20 miles, roadmix asphalt surface.

Illipah to 5 miles east, roadmix asphalt surface, 24 feet wide.

West foot to east foot of Connors Pass, 6.5 miles, plantmix surface 32 feet wide.

Under construction are 19.9 miles from East Ely to Connors Pass, 32-foot plantmix asphalt surface and, from Cherry Creek to a junction of U. S. 50, 5 miles north of Schellbourne, 8.23 miles of new construction with 24-foot roadmix surface.

Division Four has 11 maintenance sections, including the East Ely headquarters, at which maintenance crews are stationed. Each crew maintains 50 to 100 miles of road, depending on the number of men in the crew and the amount of maintenance required. Six of the stations have living quarters furnished by the Highway Department for the crews and their families. The other stations have only equipment storage facilities.

During the biennium, heavy seal and chips were placed on 74 miles of roadway, and a light seal was placed on approximately 55 miles. Asphalt surface was torn up, reconditioned and laid down again on about 7 miles.

Division Four sprayed approximately 500 miles of roadway shoulders, slopes, and back slopes, with a mixture of 2-4-D and diesel oil for Halogeten control. This was accomplished as a joint venture with the Bureau of Land Management. The Bureau of Land Management furnished the 2-4-D and the spray equipment, and the Highway

One of many newly developed “roadside rests.” **On US 95**, northwest of Tonopah, at Miller's station, this shady spot offers water and a place to picnic.

Department furnished the diesel oil for the spray, gas and oil for the equipment and the labor required to do the spraying.

During the fall of 1953, about 500 cubic yards of salt were hauled from Wendover. This was placed in different sections to be mixed with sand and used for sanding icy roads. Most of the salt is stored in East Ely and it is anticipated the supply will last two to three years.

The last two winters have been comparatively mild and required a minimum of snow removal, although there was a considerable amount of slick icy roads. Due to the increasing speed of traffic on the highways it is becoming necessary to do more sanding of slick roads, and during the last winter the maintenance crews spent almost as much time sanding roads as was spent on snow removal.

The Highway Department built a new maintenance garage at Baker and is planning a new one at Eureka.

East Ely maintains a repair shop for equipment, a blacksmith shop, a paint shop, and office space for the division engineer, the assistant division engineer, and the clerical force of the Division.

DIVISION FIVE

Division Five, with headquarters and equipment repair shops located in Tonopah, is responsible for construction and maintenance of 777 miles of highways in Esmeralda, Lander, Mineral, and Nye Counties.

Storage garage, Mina. Built to last, structures of this type provide protection for equipment, both from weather and vandalism. During the next few years it will be necessary to bring many of our stations up to similar standards.

Seven highway contracts were completed in this Division during the biennium at a cost of $1,195,000. The following is a list of contracts:

10.2 miles second story on U. S. 6 near Rattlesnake.

6.5 miles new construction on S. R. 3 in Fish Lake Valley.

22.6 miles new construction on S. R. 10 from Basalt to south of Mina.

13.2 miles reconstruction plantmix surface on U. S. 95 through Hawthorne.

13.2 miles new construction on S. R. 23 north of Gabbs.

New, modern maintenance stations were built costing $335,000. One, a new headquarters composed of office buildings, shop, and equipment stalls was constructed in Tonopah. The buildings are of concrete block and steel, and comprise one of the most modern plants in the West. The other station comprised a new, modern concrete block and steel maintenance station which was built at Mina. Upon the completion of this station those at Luning and Coaldale were abandoned.

Maintenance projects were quite varied with 22 miles of highway reconditioned and widened, 216 miles flush sealed, and 16 miles sealed and screened. For the above-mentioned work and general maintenance, 13,000 cubic yards of gravel, 6000 cubic yards of oilmix material, and 600 cubic yards of sand were produced by State forces. Nine hundred and seventy thousand gallons of various types of asphalt were purchased during this period.

Miller's roadside rest is well provided with tables, fireplaces, wood and trash cans. The young trees have grown rapidly to provide the shade as pictured on page 62.

Other projects completed were: A new roadside park on U. S. 50, 6 miles east of Austin; renovating and moving house at Coaldale to Fish Lake Valley; installing five new diesel electric generating plants at outlying maintenance stations; and leveling, grading, and fencing new Tonopah maintenance site.

Following the trail of the old Carson and Colorado RR., up the canyon from Tonopah Junction, to Basalt, SR 10 is an easy climb for trucks and cars between Nevada and California.

Only one cloudburst created much trouble, that being on U. S. 6 near Warm Springs.

Snow conditions, having been particularly light the past two years, offered no unusual problems.

Equipment-wise, we have replaced one pickup truck, four dump trucks, one shovel ($\frac{3}{4}$-yd. capacity), one snow plow, and five diesel power plants. We have purchased additional equipment as follows: two pickups, one dump truck, one scoopmobile, one motor patrol, one spreader box, one snow plow, and one road broom.

The personnel problem which has existed for the last few years has eased considerably during the biennium with only 18 persons being discharged or resigning out of 55 employees, or less than 33 percent. This figure has been well over 50 percent in previous years. Eighty-six percent have over one year of service, while 55 percent have over five years' continuous service. The main reasons for the improvement in personnel are the fringe benefits and a substantial increase in salaries.

APPENDIX

TABLE NO. 1
STATEMENT OF RECEIPTS

Classification	1917-1952	1953	1954	Total	Percent
Legislative appropriation	$40,000.00			$40,000.00	.02
State tax levy	1,869,468.87			1,869,468.87	1.13
Auto license fees	7,316,920.23	$785,304.57	$821,112.30	8,923,337.10	5.42
Gasoline and fuel tax (gross)	39,668,021.00	4,441,443.73	4,767,954.97	48,877,419.70	29.66
Common carrier license	9,117,335.26	1,540,429.31	1,690,945.87	12,348,710.44	7.50
Driver's license	578,681.21	81,458.00	80,043.00	740,182.21	.45
Certificate of title	44,509.05			44,509.05	.03
Racing Commission fees	147,428.86			147,428.86	.09
Contractor's license	16,234.23			16,234.23	.01
*Miscellaneous	1,607,805.82	138,764.61	72,473.95	1,819,044.38	1.10
State Highway bonds	1,900,000.00			1,900,000.00	1.15
State Airport Fund participation on construction	20,050.40	101,538.74		121,589.14	.07
Federal participation on construction	72,201,690.07	5,684,340.61	4,902,816.80	82,788,847.48	50.24
County participation on construction	4,122,947.87		6,572.92	4,129,520.79	2.51
County participation on State maintenance	59,000.00			59,000.00	.04
County participation on county maintenance performed by State	116,654.73			116,654.73	.07
Lincoln Highway participation on construction	71,426.60			71,426.60	.04
Utah-Nevada-California Association participation on construction	23,831.47			23,831.47	.02
San Francisco-Bay City participation on construction	25,000.00			25,000.00	.02
City participation on construction	500,822.62		14,502.79	515,325.41	.31
Railway participation on grade-crossing construction	197,053.30			197,053.30	.12
Totals	$139,644,881.59	$12,773,279.57	$12,356,422.60	$164,774,583.76	100.00

*Miscellaneous: Receipts from other State departments, Federal agencies and outside parties for services rendered or materials furnished.

TABLE NO. 2

STATEMENT OF DISBURSEMENTS

Classification	1917-1952	1953	1954	Total	Percent
Construction work	$92,709,489.88	$7,000,197.54	$6,854,150.63	$106,563,838.05	65.58
Surveys, plans, estimates and right of way	6,324,490.42	580,736.02	949,768.77	7,854,995.21	4.83
General maintenance	23,282,672.70	2,158,452.76	2,515,338.95	27,956,464.41	17.21
County maintenance	114,846.29			114,846.29	.07
Maintenance buildings	628,631.61	274,392.25	508,380.99	1,411,404.85	.87
Equipment divisions and plants	3,858,410.42	203,722.26	30,383.25	4,092,515.93	2.52
*Miscellaneous	1,515,368.10	97,803.63	85,033.85	1,698,205.58	1.05
Section "31" refunds	40,107.17			40,107.17	.02
County highway bond redemption	232,168.01			232,168.01	.14
Laboratory building	21,642.18			21,642.18	.01
State Office Building, transfer of funds	285,000.00			285,000.00	.18
State Office Building, moving charges	9,579.03			9,579.03	.01
General administration	3,764,221.33	287,603.61	300,972.69	4,352,797.63	2.68
Highways and Parks magazine	231,729.68	35,831.88	27,659.81	295,221.37	.18
Public relations	53,400.76	9,558.09	4,644.32	67,603.17	.04
Road information	29,160.77			29,160.77	.02
Road maps	36,596.28	13,188.01	14,974.42	64,758.71	.04
Roadside improvement	19,851.05			19,851.05	.01
July traffic count	184,990.00	11,625.86	13,374.21	209,990.07	.13
Public Service Commission, salaries	13,600.00		77,000.00	90,600.00	.06
Public Service Commission, Safety Division	100,655.34	23,466.11	18,981.00	143,102.45	.09
Public Service Commission, Highway Patrol	767,172.81	174,791.66	313,254.00	1,255,218.47	.77
Public Service Commission, Drivers License Division	560,597.92	58,244.82	88,070.00	706,912.74	.43
Publc Service Commission, Motor Vehicle Division	144,113.22	78,195.20	84,856.00	307,164.42	.19
Public Service Commission, inspectors	545,529.82			545,529.82	.34
Common carrier and truck refunds	30,780.95	155.50	795.70	32,236.68	.02
Gasoline and use fuel tax refunds	2,541,931.13	220,939.95	213,817.53	2,976,688.61	1.83
Gasoline tax administration	125,064.00	13,316.26	22,430.00	160,810.26	.10
Use fuel tax administration	76,085.94	9,567.98	21,842.74	107,496.66	.07
Research and investigation	504,157.30	162,464.43	165,442.14	832,063.87	.51
Totals	$138,752,044.11	$11,414,253.82	$12,311,171.00	$162,477,468.93	100.00
Transfer to Revolving Fund	92,452.02			92,452.02	
Totals	$138,844,496.13	$11,414,253.82	$12,311,171.00	$162,569,920.95	

*Miscellaneous: Charges to other State departments, Federal agencies and outside parties for services rendered or materials furnished. for which the Department is to be reimbursed.

Reconciliation—

Total receipts	$164,774,583.76
Total disbursements	162,569,920.95
State Highway balance July 1, 1954	$2,204,662.81
Lists filed July 5, included in disbursements	1,069,069.13
State Controller's balance July 1, 1954	$3,273,731.94

TABLE NO. 3

FEDERAL-AID ALLOTMENTS

1921	and prior— Regular	$3,527,276.18
1922	Regular	953,436.78
1923	Regular	635,624.52
1924	Regular	826,360.27
1925	Regular	947,623.25
1926	Regular	956,576.00
1927	Regular	948,318.00
1928	Regular	948,510.00
1929	Regular	957,995.00
1930	Regular	960,375.00
1930	Public lands	588,914.00
1931	Regular	1,601,408.00
1931	Unused portion Hawaii allotment	4,288.00
1931	Advance	904,961.83
1932	Regular	1,598,987.00
1932	Public lands	440,683.00
1933	Regular	1,421,688.63
1933	Emergency	1,575,756.00
1934	National recovery	4,545,917.00
1935	National recovery	2,302,356.00
1935	Public lands	542,125.00
1936	Regular	1,595,501.00
1936	Public lands	553,135.00
1936	Works program, highway	2,243,074.00
1936	Works program, grade-crossing elimination	887,260.00
1937	Regular	1,593,978.00
1938	Regular	1,632,385.00
1938	Secondary highways	326,477.00
1938	Grade-crossing elimination	250,000.00
1938	Public lands	560,201.00
1939	Regular	1,590,172.00
1939	Secondary highways	318,034.00
1939	Grade crossings	243,750.00
1939	Public lands	559,895.00
1940	Regular	1,275,938.00
1940	Secondary highways	191,391.00
1940	Grade crossings	97,500.00
1940	Public lands	212,442.00
1940	Regular (reapportioned from other States)	6,718.00
1940	Secondary (reapportioned from other States)	690.00
1940	Grade crossings (reapportioned from other States)	781.00
1941	Regular	1,462,071.00
1941	Secondary highways	190,705.00
1941	Grade crossings	146,250.00
1941	Public lands	436,062.00
1941	Regular (reapportioned from Georgia)	4,919.00
1941	Secondary (reapportioned from Georgia)	738.00
1941	Grade crossings (reapportioned from Georgia)	358.00
1942	Regular	1,274,718.00
1942	Secondary highways	223,076.00
1942	Grade crossings	97,500.00
1942	Public lands	310,692.00
1943	Regular	1,275,386.00
1943	Secondary highways	223,193.00
1943	Grade crossings	97,500.00
1943	Strategic, net	318,847.00
1943	Advance engineering	127,539.00
1946	Regular	2,868,043.00
1946	Secondary highways	1,921,867.00
1946	Urban	60,613.00
1947	Regular	2,868,649.00
1947	Secondary highways	1,922,269.00
1947	Urban	60,613.00
1948	Regular	2,829,804.00
1948	Secondary highways	1,896,250.00
1948	Urban	59,836.00
1950	Regular	2,564,998.00
1950	Secondary highways	1,718,707.00
1950	Urban	53,853.00
1951	Regular	2,562,973.00
1951	Secondary highways	1,717,361.00
1951	Urban	53,853.00
1952	Regular	2,885,661.00
1952	Secondary highways	1,928,291.00
1952	Urban	92,917.00
1953	Regular	2,863,524.00
1953	Secondary highways	1,913,466.00
1953	Urban	92,199.00
1954	Regular	3,174,465.00
1954	Secondary highways	2,121,392.00
1954	Urban	102,203.00
1954	Federal lands	400,000.00

TABLE NO. 3—*Continued*

1954	Interstate	$322,835.00
1955	Regular	3,179,310.00
1955	Secondary highways	2,124,823.00
1955	Urban	102,729.00
1955	Interstate	323,336.00
Subtotal		$92,304,895.46

OTHER FEDERAL FUNDS UTILIZED

Defense Act access funds	$1,958,757.90
Postwar access funds	692,811.90
Flight strips (special)	637,513.04
Flight strips (regular)	569,452.02
Subtotal	$3,858,534.86
Total	$96,163,430.32

TABLE NO. 4

MAINTENANCE—FISCAL YEAR ENDING JUNE 30, 1953

Mileage by Road Types

		Miles	Percent
1. Earth			
Unimproved			
Graded and drained			
2. Gravel		205.6	5.27
3. Mixed bituminous		3,638.6	93.30
Roadmix	2,903.1		
Plantmix	735.5		
4. Other hard surface		55.8	1.43
Portland cement concrete	2.6		
Bituminous concrete	4.1		
Bituminous penetration	14.7		
Bituminous surface-treated	34.4		
Totals		3,900.0	100.00

Mileage by Systems

1. Federal-aid primary		2,183.5	55.99
Rural	2,132.0		
Urban	51.5		
2. Federal-aid secondary		1,601.1	41.05
Rural	1,593.0		
Urban	8.1		
3. State system		115.4	2.96
Rural	112.4		
Urban	3.0		
Totals		3,900.0	100.00

TABLE NO. 5

MAINTENANCE—FISCAL YEAR ENDING JUNE 30, 1954

Mileage by Road Types

		Miles	Percent
1. Earth			
Unimproved			
Graded and drained			
2. Gravel		214.1	5.47
3. Mixed bituminous		3,645.6	93.11
Roadmix	2,909.0		
Plantmix	736.6		
4. Other hard surface		55.8	1.42
Portland cement concrete	2.6		
Bituminous concrete	4.1		
Bituminous penetration	14.7		
Bituminous surface-treated	34.4		
Totals		3,915.5	100.00

Mileage by Systems

1. Federal-aid primary		2,183.5	55.76
Rural	2,132.0		
Urban	51.5		
2. Federal-aid secondary		1,616.6	41.29
Rural	1,608.5		
Urban	8.1		
3. State system		115.4	2.95
Rural	112.4		
Urban	3.0		
Totals		3,915.5	100.00

TABLE NO. 6

EXPENDITURES FOR VARIOUS MAINTENANCE OPERATIONS ON ALL ROADS MAINTAINED BY THE DEPARTMENT DURING FISCAL YEAR ENDED JUNE 30, 1953

Operation	Expenditures	Percent
Patching holes, ruts, and spot sealing	$404,732.66	18.75
Dragging, blading, reshaping, etc.	26,196.18	1.21
Filling, trimming expansion joints and cracks	260.63	.01
Applying light seal and blotter or chips	117,412.86	5.44
Application of dust palliatives	177.83	.01
Sand, gravel, and crushed stone replacement	46,847.80	2.17
Reprocessing bituminous surfaces	42,436.31	1.97
Bituminous surface treating, heavy chips, etc.	243,700.58	11.29
Patching, dragging, blading shoulders and approaches	186,053.11	8.62
Bituminous treatment of shoulders	69,689.81	3.23
Construction of new approaches	6,150.58	.29
Reprocessing bituminous shoulder surfaces	1,956.18	.09
Repairing of cuts, fills and slopes	125,999.17	5.84
Cleaning and retrenching drains, channels, etc.	86,451.33	4.00
Removal of debris	214,490.62	9.94
Roadside development and landscaping projects	10,663.60	.49
Repair and maintenance of sidewalks, retaining walls, etc.	15,348.17	.71
Halogeton control (special control operations)	163.36	.01
Repairing, repainting, resetting markers, signals, etc.	136,520.58	6.33
Traffic lane and center striping	106,315.90	4.93
Repair and maintenance of guard rails	12,823.92	.59
Highway, bridge, and approach lighting	413.21	.02
Comfort stations and picnic ground operations	3,852.38	.18
Traffic and pedestrian crossing markings	6,234.06	.29
Patrolling for the protection of the public	20,158.74	.93
Erection and removal of snow fence, markers, etc.	17,793.02	.82
Snow and ice removal	129,775.43	6.01
Sanding icy surfaces	43,910.64	2.03
Opening waterways and gutters due to snow and ice	2,757.50	.13
Removal of sand drifts	233.53	.01
Maintaining road blockades during storms	977.74	.05
Cleaning and opening channels	3,678.60	.17
Repairs to structures	1,992.42	.09
Painting and linseed oil treatment to structures	81.81	.01
Pumping plants and electricity in structures	2,692.03	.12
Bridge inspections	1,772.03	.08
Extraordinary repairs due to catastrophe	33,228.53	1.54
Total direct expenditures	$2,123,942.85	98.40
Maintenance administration (Headquarters)	34,509.91	1.60
Total for fiscal year 1952–1953	$2,158,452.76	100.00
Total miles maintained: 3,899.961		
Average cost of maintenance per mile (includes snow removal)	$553.45	
Average cost of maintenance per mile (excludes snow removal)	$503.65	

TABLE NO. 7

EXPENDITURES FOR VARIOUS MAINTENANCE OPERATIONS ON ALL ROADS MAINTAINED BY THE DEPARTMENT DURING FISCAL YEAR ENDED JUNE 30, 1954

Operation	Expenditures	Percent
Patching holes, ruts, and spot sealing	$473,763.64	18.84
Dragging, blading, reshaping, etc.	32,335.41	1.29
Filling, trimming expansion joints and cracks	1,557.57	.06
Applying light seal and blotter or chips	144,390.68	5.74
Application of dust palliatives	35.06	.00
Sand, gravel, and crushed stone replacement	4,898.51	.19
Reprocessing bituminous surfaces	68,499.54	2.72
Bituminous surface treating, heavy chips, etc.	288,991.46	11.50
Patching, dragging, blading shoulders and approaches	254,376.71	10.11
Bituminous treatment of shoulders	67,280.20	2.67
Construction of new approaches	6,449.45	.26
Reprocessing bituminous shoulder surfaces	9,149.63	.36
Repairing cuts, fills and slopes	143,232.26	5.69
Cleaning and retrenching drains, channels, etc.	107,305.96	4.27
Removal of debris	249,863.77	9.93
Roadside development and landscaping projects	8,782.97	.35
Repair and maintenance of sidewalks, retaining walls, etc.	22,494.79	.89
Halogeton control (special control operations)	5,829.05	.23
Repairing, repainting, resetting markers, signals, etc.	179,933.41	7.15
Traffic lane and center striping	109,683.71	4.36
Repair and maintenance of guard rails	10,888.26	.43
Highway, bridge, and approach lighting	890.11	.04
Comfort stations and picnic ground operation	10,699.52	.43
Traffic and pedestrian crossing markings	5,377.93	.21
Patrolling for the protection of the public	29,307.09	1.17
Erection and removal of snow fence, markers, etc.	18,929.10	.75
Snow and ice removal	144,526.51	5.75
Sanding icy surfaces	35,945.30	1.43
Opening waterways and gutters due to snow and ice	3,687.26	.15
Removal of sand drifts	623.23	.02
Maintaining road blockades during storms	665.15	.03
Cleaning and opening channels	3,145.30	.13
Repairs to structures	1,184.90	.05
Painting and linseed oil treatment to structures	2,423.18	.10
Pumping plants and electricity in structures	4,373.89	.17
Bridge inspections	1,866.57	.07
Extraordinary repairs due to catastrophe	30,222.80	1.20
Total direct expenditures	$2,483,609.94	98.74
Maintenance administration (Headquarters)	31,729.01	1.26
Total for fiscal year 1953–1954	$2,515,338.95	100.00
Total miles maintained: 3,915.465		
Average cost of maintenance per mile (includes snow removal)	$642.41	
Average cost of maintenance per mile (excludes snow removal)	$590.54	

TABLE NO. 8

MAINTENANCE COSTS FROM 1918–1954

Includes Snow Removal

	Mileage			Mileage	
1918	—	$16,596.54	1936	2,656.68	$675,726.06
1919	—	29,330.21	1937	2,697.82	846,033.35
1920	—	44,323.34	1938	2,770.20	756,305.26
1921	—	33,601.26	1939	2,805.90	830,877.60
1922	—	61,997.55	1940	2,908.48	763,075.33
1923	442.98	110,724.87	1941	2,941.22	774,573.50
1924	765.23	122,788.60	1942	3,015.76	848,789.57
1925	903.90	215,168.70	1943	3,047.80	745,480.25
1926	1,213.43	306,899.52	1944	3,084.67	703,340.85
1927	1,445.08	343,399.28	1945	3,081.740	773,778.26
1928	1,680.73	359,262.08	1946	3,093.242	855,194.89
1929	1,875.16	418,065.08	1947	3,273.091	1,051,422.22
1930	1,905.43	500,752.46	1948	3,421.747	1,256,025.61
1931*	2,061.34	301,166.64	1949	3,507.980	1,429,074.18
1932	2,113.02	618,377.41	1950	3,565.956	1,469,479.06
1933	2,151.64	566,845.41	1951	3,750.088	1,620,297.11
1934	2,287.37	502,715.66	1952	3,770.602	2,256,174.39
1935	2,524.77	617,784.47	1953	3,899.961	2,158,452.76
			1954	3,915.465	2,515,338.95

*Seven months' expenditures, December 1, 1930, to June 30, 1931.

TABLE NO. 9

SNOW REMOVAL COSTS 1923–1954

1923*	$12,695.38	1939	$71,681.61
1924	884.53	1940	42,403.61
1925	1,479.13	1941	57,008.71
1926	1,803.43	1942	87,357.42
1927	8,228.95	1943	60,386.97
1928	3,167.50	1944	94,585.25
1929	16,172.05	1945	103,521.25
1930	19,466.28	1946	104,222.71
1931	4,711.45	1947	102,053.10
1932	83,632.96	1948	130,913.49
1933	83,497.61	1949	368,127.41
1934	8,227.13	1950	170,748.71
1935	28,573.76	1951	122,757.57
1936	50,948.37	1952	603,200.27
1937	131,066.03	1953	194,236.59
1938	59,468.88	1954	203,088.17

*Snow removal costs prior to 1923 not available.

TABLE NO. 10

CONSTRUCTION AND RECONSTRUCTION COMPLETED AND UNDER CONTRACT ON THE DESIGNATED STATE HIGHWAY SYSTEM AT THE CLOSE OF THE BIENNIUM

Type	Miles new construction completed during biennium	Miles reconstruction completed during biennium	Miles new construction under contract at close of biennium	Miles reconstruction under contract at close of biennium	Totals
Gravel	95.7	—	—	—	95.7
Roadmix	244.1	78.8	97.5	13.2	433.6
Plantmix	9.2	154.4	—	145.9	309.5
Totals	349.0	233.2	97.5	159.1	*838.8

*Includes 7.0 miles constructed with forest highway funds by Bureau of Public Roads.

TABLE NO. 11
BRIDGE AND GRADE SEPARATION SUMMARY

Type	Structures Built by State Highway Department					
	Constructed or under construction as of June 30, 1952	Constructed during biennium or under construction as of June 30, 1954	Structures abandoned during biennium	Total as of June 30, 1954	Structures on highway system *not* built by State Highway Department	Total structures as of June 30, 1954
Plain concrete	4	0	0	4	1	5
Reinforced concrete	119	12	2	129	1	130
Structural steel	28	0	0	28	10	38
Timber	57	0	11	46	9	55
Composite structures (reinforced concrete and structural steel)	11	0	0	11	0	11
Totals	219	12	13	218	21	239
Total length of structures in feet	19,701	791	526	19,966	1,778	21,744
Average length of bridge in feet	90	66	40	92	85	91

TABLE NO. 12

DESCRIPTION OF FEDERAL–AID ROADS, JUNE 30, 1954

F. A. Road No.	Termini	*Mileage
1	U. S. 40 from the California-Nevada State line near Verdi via Reno, Sparks, Fernley, Lovelock, Winnemucca, Battle Mountain, Elko and Wells to the Nevada-Utah State line at Wendover, except those portions in the Reno-Sparks and Elko urban areas	408.7
2	U. S. 50 and Alternate U. S. 50, from the California-Nevada State line southwest of Spooners via Carson City, Dayton, Fallon, Austin, Eureka, and Ely to a junction with U. S. 40 near Wendover	467.6
3	U. S. 395 from the California-Nevada State line south of Holbrook via Minden to a junction with U. S. 50 three miles south of Carson City; beginning again in Carson City and continuing through Reno to the Nevada-California State line northwest of Reno, except that portion within the Reno urban area	76.9
4	U. S. 6 from the California-Nevada State line southwest of Basalt, via Coaldale and Tonopah to a junction with U. S. 50 in Ely; beginning again in East Ely and via Connors Pass and Sacramento Pass to the Nevada-Utah State line en route to Delta, Utah	306.1
5	U. S. 91 from the California-Nevada State line south of Jean via Jean, Las Vegas, North Las Vegas (along both Fifth and Main Streets), Glendale, and Mesquite to the Nevada-Arizona State line, except that portion within the Las Vegas urban area	120.5
6	U. S. 95 from the California-Nevada State line south of Searchlight via Searchlight, Railroad Pass, Las Vegas, Beatty, Goldfield, Tonopah, Mina, and Hawthorne to a junction with U. S. 50 south of Fallon; beginning again at the junction with U. S. 50 at Leeteville via Hazen to a junction with U. S. 40 east of Fernley; beginning again at the junction of U. S. 40 in Winnemucca via Orovada to the Nevada-Oregon State line at McDermit; also a spur from Railroad Pass via Boulder City to the Nevada-Arizona State line at Hoover (Boulder) Dam, except that portion within the Las Vegas urban area	511.9
7	U. S. 93 from Caliente via Pioche to a junction with U. S. 6 at the east foot of Connors Pass; beginning again at the junction of Alternate U. S. 50, five miles south of the Elko-White Pine County line via Currie, Wells, and Contact to the Nevada-Idaho State line north of Contact	252.0
8	State Route 25 from a junction with U. S. 93 one mile west of Panaca via Panaca to the Nevada-Utah State line en route to Modena, Utah	20.9
Total		2,164.6

*Surveyed mileages used on roads having unimproved sections as of June 30, 1954. There were 9.0 miles unimproved on F. A. Route 5; 1.2 miles unimproved on F. A. Route 2.

TABLE NO. 12-A

DESCRIPTIONS OF FEDERAL-AID URBAN ROUTES, JUNE 30, 1954

F. A. U. Route No.	Termini	*Mileage
	Elko Urban Area Routes	
010350	Along road to Mountain City from junction with U. S. 40 northwesterly to a junction with F. A. S. 571 (S. R. 11) at Elko west urban limit	0.5
010351	U. S. 40 from Elko west urban limit along Idaho Street to Elko north urban limit	2.6
010360	Along road to Lamoille (Fifth Street) from junction with U. S. 40 to a junction with F. A. S. 572 (S. R. 46) at Elko east urban limit	1.7
	Las Vegas Urban Area Routes	
030265	Fifth Street in Las Vegas from the south urban limit of Las Vegas to the north urban limit of Las Vegas	3.4
030275	Main Street in Las Vegas from its south junction with Fifth Street to the north urban limit of Las Vegas	3.0
030266	Along Charleston Boulevard and Rancho Road from the Charleston Boulevard junction with U. S. 93 near the east urban limit of Las Vegas to the junction of Rancho Road with U. S. 95	4.4
030276	Along U. S. 93 (Fremont Street) from the east urban limit of Las Vegas to the junction of Fremont and Main Streets	1.9
030286	Along Bonanza Road and U. S. 95 from the junction of Fifth Street and Bonanza Road to the north urban limit of Las Vegas	3.1
	Reno-Sparks Urban Area Routes	
040310	Kietzke Lane extension from East Second Street in Reno to a junction with U. S. 40 in Sparks	1.1
040311	U. S. 40 from Reno west urban limit to Sparks east urban limit	5.4
040313	U. S. 395 from Reno south urban limit to Reno north urban limit	3.0
040320	From a junction with U. S. 395 at the Reno south urban limit (intersection of Plumb Lane extended) via intersection of Holcomb Avenue and Burns Street to a junction with East Second Street in Reno	1.5
Total		31.6

*Surveyed mileage used on routes having unimproved sections.

TABLE NO. 13

TABLE SHOWING STATUS OF MILEAGE ON THE VARIOUS "STATE–INTEREST" HIGHWAY SYSTEMS IN NEVADA AS OF DECEMBER 31, 1953

County	Improved by State Highway Department				*State-interest roads not improved by State	Grand total, all types and all systems
	Federal-aid system	Federal-aid secondary system	Remaining State Highway system	Total		
Churchill	145.7	61.1	....	206.8	[1]51.2	258.0
Clark	264.5	158.9	1.2	424.6	[2]232.6	657.2
Douglas	49.4	39.1	1.4	89.9	16.7	106.6
Elko	333.4	166.6	....	500.0	330.6	830.6
Esmeralda	115.9	65.7	49.2	230.8	21.7	252.5
Eureka	74.0	88.6	0.1	162.7	141.7	304.4
Humboldt	135.3	100.3	0.1	235.7	181.6	417.3
Lander	103.9	105.8	20.6	230.3	118.6	348.9
Lincoln	99.8	153.0	....	252.8	144.3	397.1
Lyon	62.9	144.3	....	207.2	89.3	296.5
Mineral	107.5	79.1	....	186.6	49.9	236.5
Nye	240.7	166.0	25.6	432.3	275.3	707.6
Ormsby	20.7	11.5	3.8	36.0	4.7	40.7
Pershing	75.0	37.0	....	112.0	180.9	292.9
Storey	....	12.7	....	12.7	22.8	35.5
Washoe	89.8	133.0	14.7	237.5	[3]327.1	564.6
White Pine	265.0	103.2	....	368.2	138.5	506.7
Totals	2,183.5	1,625.9	116.7	3,926.1	2,327.5	6,253.6

Mileage by Surface Types and Systems, as of December 31, 1953

	Federal-aid system	Federal-aid secondary system	Remaining State Highway system	Total	*State-interest roads not improved by State	Grand total, all types and all systems
(A-B) Primitive and unimproved	....	....	....	....	701.7	701.7
(C-D) Graded and drained and soil-surfaced	....	....	....	....	284.6	284.6
(E) Gravel or crushed stone	....	123.2	90.9	214.1	1,231.4	1,445.5
(F) Bituminius surface treated	....	34.1	0.4	34.5	54.9	89.4
(G) Roadmix or plantmix surface	2,168.9	1,462.4	24.7	3,656.0	53.8	3,709.8
(H-I) High-type bituminous	12.7	5.6	0.6	18.9	1.1	20.0
(J) Portland cement concrete	1.9	0.6	0.1	2.6	....	2.6
Totals	2,183.5	1,625.9	116.7	3,926.1	2,327.5	6,253.6

*State-interest roads are all routes on the State designated system or the Federal-aid secondary system.

[1]1.2 miles proposed RS 002-2. [2]9.0 miles proposed RS 005-2 (SR 6). [3]1.5 miles proposed FAU No. 040320. 1.1 miles proposed FAU No. 040310.

TABLE NO. 14

COMPARISON OF AVERAGE DAILY TRAFFIC AT AUTOMATIC RECORDERS FOR EIGHT FISCAL YEAR PERIODS

Station	Location	Daily Average							
		1946-1947	1947-1948	1948-1949	1949-1950	1950-1951	1951-1952	1952-1953	1953-1954
101	U. S. 40, east of Sparks	2,120	2,281	2,286	2,573	2,825	2,990	3,260	3,555
102-A	U. S. 91 and 466, south of Las Vegas	2,249	2,347	2,497	2,561	3,325	3,940	4,463	5,073
103	State Route 46, south of Elko	237	290	309	417	424	500	564	580
104	U. S. 395, north of Carson City	1,775	1,820	1,688	1,847	2,035	2,132	2,396	2,674
106	State Route 59, south of Lovelock	415	316	314	334	392	394	393	394
107	U. S. 40, east of Elko	1,207	1,424	1,513	1,794	2,176	2,307	2,527	2,476
108	U. S. 50 and 93, north of McGill	392	488	475	499	587	644	665	691
109	U. S. 6 and 93, south of East Ely	388	440	438	432	509	556	637	761
110	U. S. 93 and 95, southeast of Las Vegas	4,953	4,905	5,072	5,626	6,330	8,050	9,606	10,504
112	U. S. 6 and 95, west of Tonopah	416	461	465	498	586	611	712	740
114	U. S. 95, northwest of Las Vegas	371	395	404	427	613	1,419	1,304	1,124
115-A	U. S. 40, east of Wells	761	819	847	905	1,264	1,314	1,378	1,569
116	U. S. 40 west of Verdi	1,916	2,104	2,153	2,485	2,731	2,843	3,343	3,741
117	State Route 12, north of Logandale	373	372	372	387	421	453	541	537
118	U. S. 50, east of Spooners	858	961	1,017	1,086	1,114	1,311	1,476	1,648
119	State Route 3, south of Yerington	474	455	527	554	599	670	787	938
120	U. S. 91 and 93, north of Nellis Air Base	--------	--------	--------	1,567	1,804	2,131	2,306	2,579
121	U. S. 40 and 95, northeast of Lovelock	--------	--------	--------	1,400	1,658	1,822	1,859	2,051
122	U. S. 40, west of Battle Mountain	--------	--------	--------	1,078	1,322	1,471	1,594	1,685
123*	U. S. 50, one mile west of Peterson's Maintenance Station	--------	--------	--------	--------	--------	--------	--------	242

*Recorder installed June 1, 1953.

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